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This Week in The IRON AGE

Vol. 154, No. 18 November 2, 1944

Editorial

Scotch Mists and Myths ... 45

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Technical Articles

An Appraisal of Precision Thread Rolling Practice ... 48
Plastic Coatings for Metals ... 56
Surface Inspection by Projected Plastic Film ... 57
Measuring and Designating Surface Finish ... 58
Two Million Volt X-Ray Tube ... 62
Tank Production in the Soviet East ... 63
Shot Peening ... 67
New Equipment ... 72

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Features

News Front ... 47
Assembly Line ... 76
Washington ... 80
West Coast ... 84
Personals and Obituaries ... 88
Fatigue Cracks ... 90
Dear Editor ... 92
This Industrial Week ... 94
News of Industry ... 97

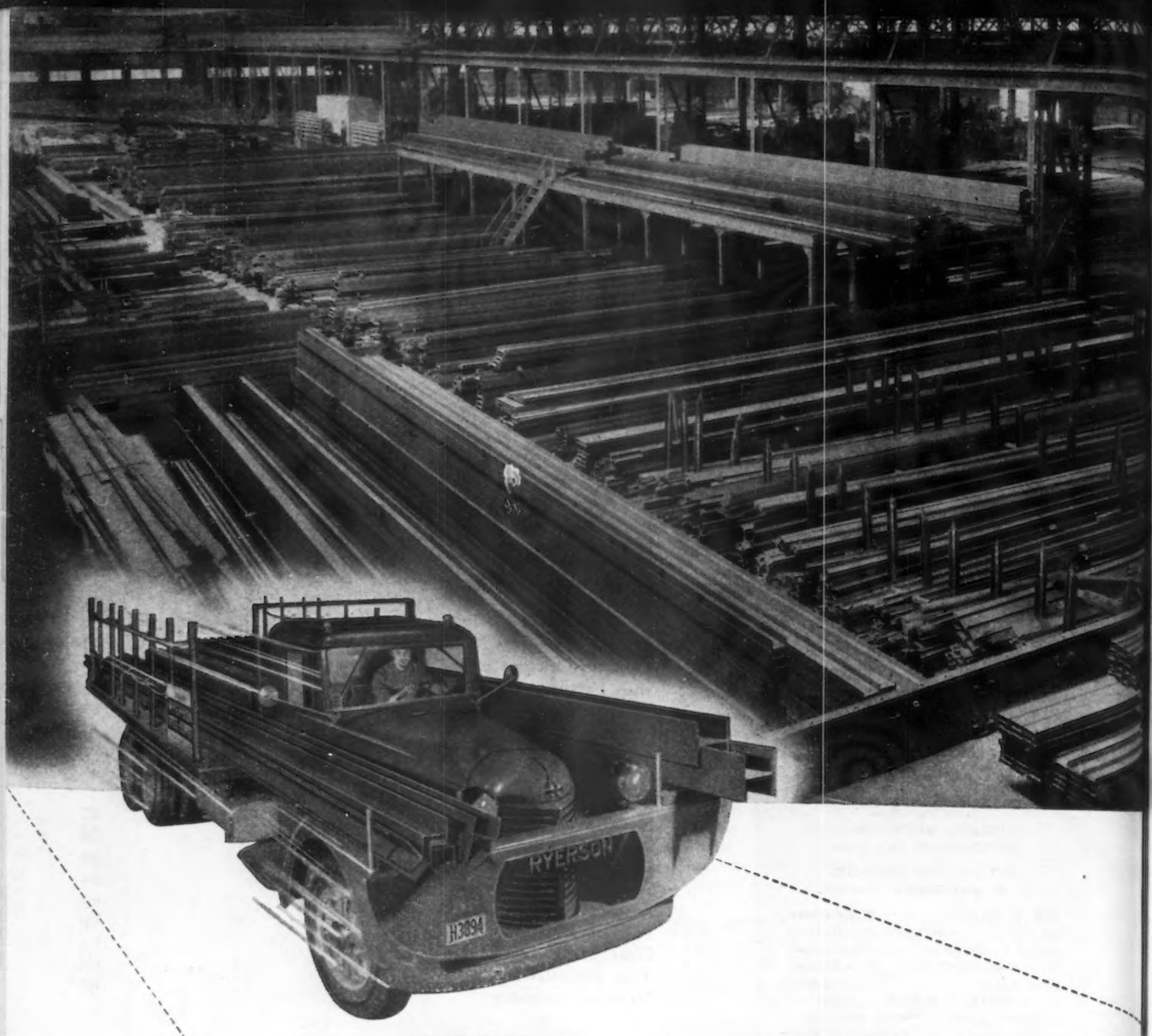
o o o

News and Markets

Civilian Output Publicity Attacked ... 97
Freight Car Inquiries Lagging ... 97
Machine Tool Builders' Problems ... 111
India as Postwar Market ... 124
Bethlehem Modernizes Shipyards ... 126
Highway Postwar Construction ... 128
Controls on Copper Lifted ... 130
Truck Production Off ... 130
Machine Tool Market Developments ... 144
Non-Ferrous Metals News and Prices ... 146-147
Iron and Steel Scrap News and Prices ... 148-149
Comparison of Prices by Week and Year ... 150
Finished Iron and Steel, NE Steel Prices ... 152
Warehouse, Semi-Finished, Tool Steel Prices ... 154-156
Steel Pipe, Tubing, Wire Products, Prices ... 158-159
Pig Iron and Coke Prices ... 160-161
Stainless Steel and Ferroalloy Prices ... 162-163

o o o

Index to Advertisers ... 241



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Scotch Mists and Myths

(Cabled from Glasgow)

SCOTLAND has come up the hard way, and its industries show the earmarks of the struggle in a highly developed sense of practicality and also in the Scottish characteristic of making the way fit the means. For where else in the world would you find men able to launch 700-ft. ships endwise in a river not much more than 200 ft. wide.

Many a Scottish shipbuilder or steelmaster went forth to technical college with a bag of porridge meal and a sack of kippers as his total assets supplemented only by his scholarship. And many of them, knighted for accomplishment and not for birth, are today addressed as Sir John or Lord So-and-So. True democracy recognizes the aristocracy of accomplishment.

The same sense of practicality and common sense has permeated to the ranks of labor in the Scottish and also the English steel industry. There is almost no possibility of the occurrence of strikes, I have been told by both management and labor. The procedure in handling grievances in case an individual or group believes some working condition should be altered has been worked out in elaborate detail and is acceptable to both parties.

The first contact is made with the foreman. If he cannot settle it, the case goes to the works manager. Should no agreement be reached at that level, an impartial committee is appointed, made up of two representatives for management and two from labor. Failing to arrive at a decision here, which seldom occurs, the problem is put before the plant labor relations head whose job it is to try to see that it goes no farther. But should it have to, there are yet several more steps or stages to go through before a strike can be considered. These steps terminate in the submission of the case to the national management and labor authorities. Even then a 20-day notification of intention to strike has to be filed, whereupon the Ministry of Labor steps in and sees to it that it does not stop there. Over here there is no running to a biased labor relations board by a disgruntled employee with consequent punitive action against the employer. Nor, while the process takes considerable time if it goes the whole road, is there the allowance of retroactive wages except by prior agreement.

Labor unionism in British steel is grown up. A shop steward who had not served at least 10 years in a plant would not be considered by the workers as capable of representing them. And when management and labor come to grips with a dispute, they do it as gentlemen who respect each other and not as sidewalk gangsters who hurl abuse and brickbats. We can learn a lot from the Scotch.

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The IRON AGE
October 31, 1944

NEWS FRONT

► General Motors plans to produce about half a million cars upon reconversion will require its ordering 800,000 tons of steel and approximately 125,000 tons of iron as soon as it gets the go-ahead signal.

Evidently GM's initial plans do not include the use of aluminum either for motor blocks or for sheet metal sections.

One of the problems facing GM is that so many Fisher Division presses have been sold, leased or loaned for the war period that the company is concerned over the availability of stamping facilities in the event of sudden permission to resume automobile production.

► The development of new synthetic coatings for metals and the improvement in those in use prior to 1939 will make available during the postwar period many plastic materials to improve metal surfaces, cut finish costs and increase the salability and market value of metal products. These materials include the alkyd resins, melamine resins, acrylic resins and phenolic resins.

► There are at present open inquiries for only 3450 railroad cars for domestic roads, and Army requirements have been trimmed from 26,260, as originally scheduled for 1945, to 10,470.

Meanwhile: Foreign car purchases, except for those which the Army is handling, are bogging down short of the order stage. France, India, and South American nations are all anxious to place car orders, but none has actually been effected.

► A new synthetic resin has been perfected by Monsanto Chemical Co. When properly used in a low-pressure lamination process, the company claims that this resin will all but eliminate size as a restrictive factor in postwar plastics.

► A 400-passenger airplane, the largest ever contemplated, is in the mockup stage at the Consolidated-Vultee plant, and will be that company's major postwar effort. It will be made of the new high-strength aluminum alloys and considerable quantities of magnesium.

An unusual feature is the six large air-cooled radial motors, driving three-blade reversible-pitch propellers. As such it will resemble some of the aircraft of the future so frequently portrayed in popular magazines, and is likely a civil variation of the Consolidated C-99 transport airplane, which has been announced as having six motors driving pusher propellers.

► The traveling salesman is back on the road again, selling surplus war materials. Westinghouse has put a corps of salesmen in the field, calling on manufacturers and jobbers, with lists of materials declared surplus because of changes or curtailment of war contracts.

► The U. S. now holds within this country 300,382 prisoners of war; 248,205 Germans, 51,034 Italians, and 1143 Japanese.

► In one day of fighting in France, two-thirds of a German Panzer force was knocked out or damaged by bazooka teams and aircraft rockets. In some cases rockets have blasted through 6 in. of armor plate. Rockets themselves do not penetrate armor, but punch a hole through the plate by a terrific concentrated and directed blast effect that throws hot fragments of steel through to the other side.

► Lend-lease steel will be an almost negligible factor in steel distribution during the first quarter of 1945. For the fourth quarter, Great Britain, which has always taken the bulk of lend-lease steel shipments, has reduced its ingot and semi-finished requirements.

► Cutting fluoroscopic sensitivity from 10 to 5 per cent has made possible the wider use of fluoroscopy in detecting small flaws.

► Pacific Coast foundrymen are attempting to standardize materials and practices for the industry there. This year's preliminary survey covers the character of sand in use and under development, both Eastern and Western. Findings show that the green sand drying method is preferred over skin drying or oven drying.

One of the situations requiring standardization is the lack of uniformity in the unit of measurement employed by members. Units used range from tons through gallons, pounds, quarts and parts to percentages.

An Appraisal of Precision Thread Rolling

. . . In recent years there has been a marked swing toward the use of the rolled thread in the aircraft industry in place of the ground thread for high precision work. In this and succeeding articles an attempt is made to appraise all the factors bearing on the problem of rolling thread in high strength alloy steel with hardnesses ranging up to 36 Rockwell C and with tolerances corresponding to Class 3 and 4 fits since it is felt that this technique will be applied more widely in postwar production. In the first part, general principles are discussed and the characteristics of both straight and cylindrical die machines described.

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THREAD rolling is not a new art. Patents on rolled threading machines date back to 1838 in the United States and in London there is a machine in the South Kensington Museum dated 1851. Threads have been rolled in this country for over 60 years.

The story is told that the idea of using a flat die with grooves cut in at the helix angle of the thread originated with an Englishman who playfully rolled a bolt over a flat piece of soap during a noon hour recess and, seeing that the bolt threads produced straight line grooves on the soap bar, conceived that possibly threads could be rolled in a round blank simply by passing it between two reciprocating flat grooved dies.

The process of rolling a thread can be readily demonstrated simply by taking a pencil and rolling it between the palms of the hand. In actual practice, the blank is approximately the pitch diameter of the finished bolt thread and the stock is cold rolled out of the roots and into the crests. In the conventional thread roller employing flat dies, one is mounted stationary and the other is reciprocated through a crank and connecting rod. In recent models, refinements have been introduced to make these machines suitable for precision work.

Within the last year or two, two types of machines employing circular dies rather than straight dies with a reciprocating motion, have appeared on the market primarily to meet the high precision demands of the aircraft industry. Basically, however, these circular die machines are not new. More than 30 years ago, a machine was built in which the bolt thread was rolled between an internal rig die and an external threading die. It was never pushed commercially, however. On the Continent, precision threads have been rolled on circular die machines, particularly in Germany. The British have been using thread rolling equipment of German origin (the "Peewee") on aircraft threads since the start of the war. But whether the action is one involving straight dies or circular dies, the process is basically one of cold forming metal although some compare the work done on circular dies with that of spinning metal and on flat dies to extruding it.

While the process of thread rolling has been applied for many years to the manufacture of commercial screws and bolts that are sold by the 100-lb. keg, many production men doubted that the process would be satisfactory for machine bolts or automotive engine and aircraft bolts and studs. Today, however, threads are being rolled successfully in high strength alloy steel heat treated to a hardness in the average range of 28-32 Rockwell C and occasionally as high as Rockwell 40 C. Fig. 1 shows a representative group of aircraft bolts and studs. Furthermore, these threads are being rolled to Class 3 and Class 4 fit tolerances and occasionally to Class 5 fit tolerances.

Tracing the history of rolling precision threads in high strength on hard materials, the first application was to tool steel micrometer spindles. The Reed micrometer spindle has been produced with a rolled thread for almost 25 years and is still in production. The next application was to high speed steel taps. This job was pioneered about 20 years ago by the J. M. Carpenter Tap & Die Co. of Providence (later Detroit), since acquired by Greenfield Tap & Die Corp. The first company to experiment with high strength aircraft studs in this country was the Hartford Machine Screw Co., as far as can be ascertained.

When the war started, a heavy demand was created for grinding precision threads since cut threads could not be obtained economically on heat treated materials within the tolerances sought. Aircraft companies soon saw that it would be impossible to get enough ground screws to keep up with the program despite installation of hundreds of thread grinders. They were therefore quite ready to adopt the rolling process provided certain modifications could be made in the technique to assure the necessary close tolerances.

The impetus for this development was given by the discovery in 1938 that German airplanes were being assembled with rolled threaded screw products. This was on the occasion of a visit made to German aircraft plants by a production executive of one of the leading aircraft engine companies in the United States. It was several years, however, before this company actually adopted rolled threads in its own production.

Rolled threads not only compete with ground threads but also with milled threads on precision work. The most important advantage of the rolled thread commercially is that a Class 3 or Class 4 thread can be produced at about 60 times the rate achieved on grinding. It is generally conceded that a rolled thread is 15 to 20 per cent stronger than either a cut or a ground thread because in the cold forging process a good grain flow is produced in the thread groove since the metal is compressed and tends to follow the contour of the thread instead of being cut through as with a chaser, milling cutter or grinding

Practice

o o o

by FRANK J. OLIVER

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"Frozen Action" photo courtesy Pratt & Whitney Division, Niles-Bement-Pond Co.

wheel. Fig. 2 shows the macrostructures of a typical rolled thread. The notch effect at the root of the thread is reduced somewhat by the compression stresses which are set-up in the root during rolling; also by the fact that in aircraft threads a radius equal to ⅛ or ¼ the pitch is used at the root in place of the sharp AN two corner form.

A few months ago one of the large automotive plants making radial air cooled engines on a subcontract basis ran into an epidemic of cracked studs due to fatigue failure in the fillets. These failures were overcome by substituting rolled thread studs obtained from an outside source. When this source dried up temporarily and the company was forced to revert to ground threads, the epidemic of cracked studs immediately appeared again. This situation may be ameliorated to some extent by the proposed International Standard thread which will provide rounded crests and fillets, with the American National 60 deg. thread form. Fillets in rolled threads are already accepted since sharp corners on the crest of the dies tend to break down under the high rolling pressures, although sharp corners can and are often used when specifications demand them as, for instance, in the rolling of threads in commercial taps.

The finish on the thread is considerably better and smoother. Because of slippage that is inherent in the contact of the blank with the dies, a burnished surface is produced, much as in finishing railroad car axles, which make the screw more or less impervious to fatigue failure. Slippage is due to the difference in diameter between the root and crest of a thread and hence the difference in peripheral speed or linear distance covered in one revolution of the blank. This slippage is more pronounced in circular die machines, where the same principle applies to the dies as well

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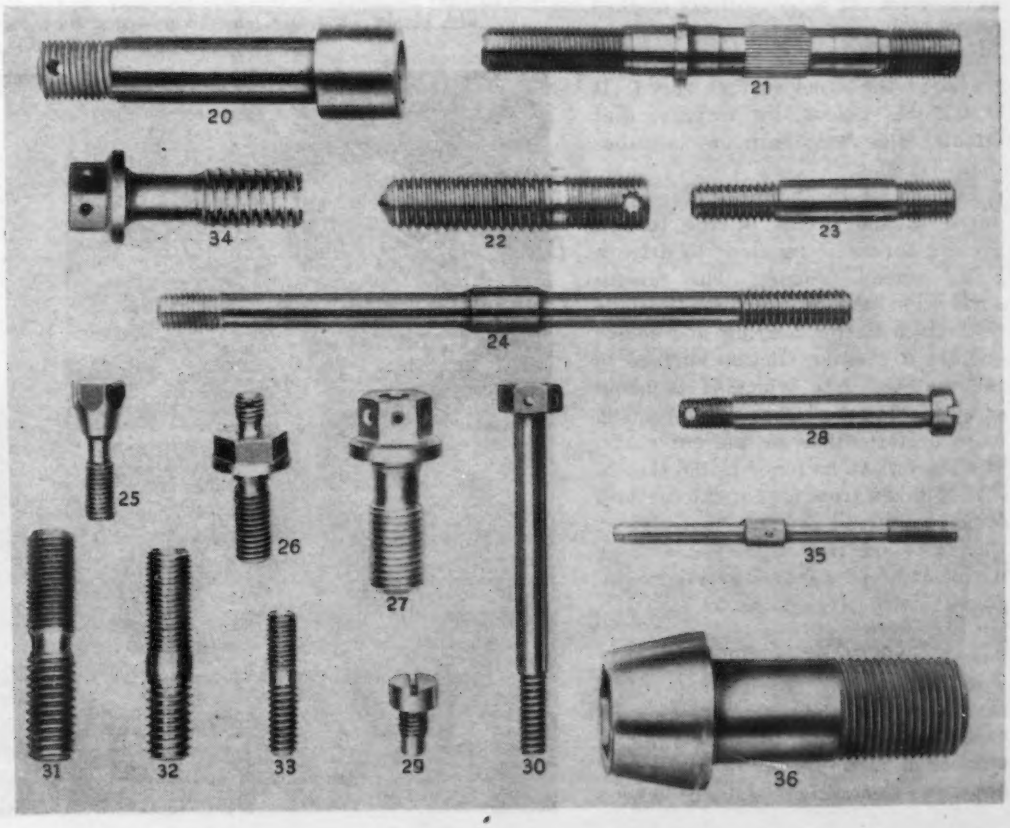

FIG. 1—An assortment of heat treated aircraft screws and threads of Class 3 and 4 tolerances. Engine studs 31, 32 and 33, which have the first two threads 0.005 in. smaller in diameter than the rest of the thread can now be rolled in one pass.

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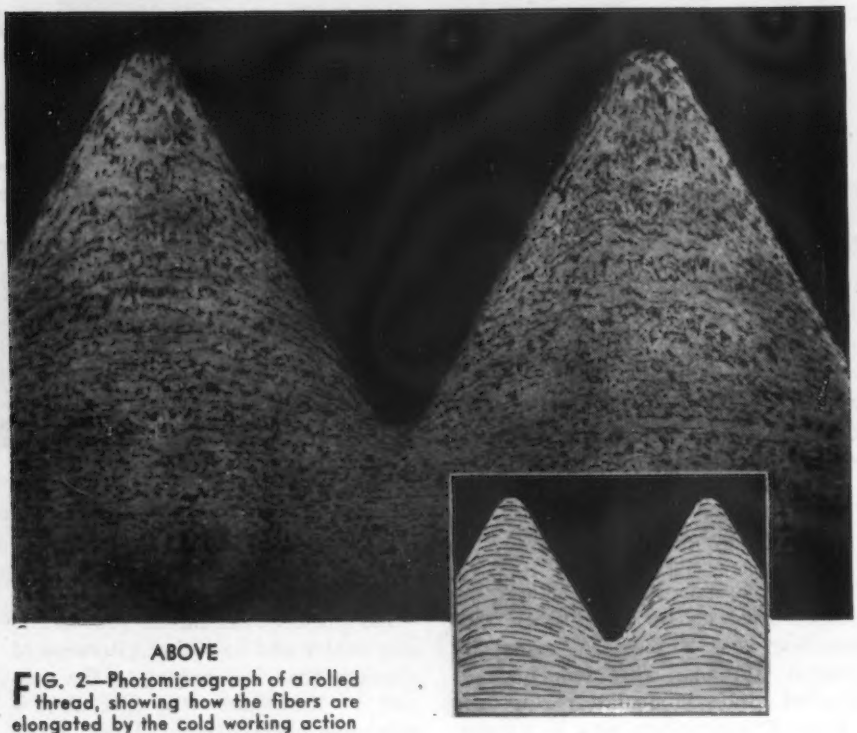
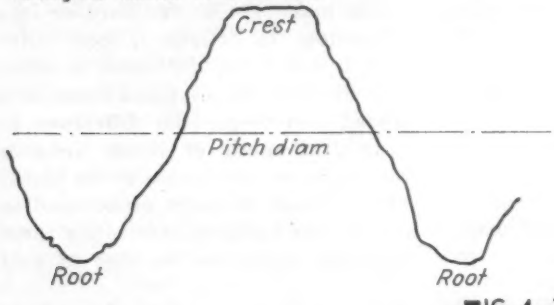


ABOVE

FIG. 2—Photomicrograph of a rolled thread, showing how the fibers are elongated by the cold working action and rearranged in unbroken flow lines along the contour of the thread.



LEFT

FIG. 3—Outline of a cut thread on a 7/16-20 heat treated alloy steel stud. This was traced from a photomicrograph (100 x) of the thread cross-section.

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machinability is good, such as in screw machine stock where the addition of sulphur lends brittleness for bettering chip fragmentation, the cold working properties are poor although threads have been successfully rolled in SAE X1112 screw stock and in SAE 1335 medium sulphur shell bodies. The machinability must be correlated with the elastic limit, which should be fair, the reduction in area and the hardness. The higher the reduction in area the better since this property is a measure of the degree of cold workability. The lower the hardness, obviously the greater ease in deforming the material cold.

On the other hand, for aircraft applications the material for bolts and studs is selected not on the basis of its workability but because of its functional requirements — principally high strength. The alloy steels most commonly used for this work have high tensile strength, high hardness and low reduction in area. Heat-treated steels with a hardness up to Rockwell 40C have been thread rolled and, as might be expected, die life is extremely low—about 5000 to 6000 pieces for a set of single faced dies (two runs). The average range of hardness encountered is between 28 and 32 Rockwell C and the die life runs between 20,000 and 30,000 threaded ends. This compares with a million or more pieces per die on soft steel bolts and studs.

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as the work. It is particularly marked in dies of small diameter. Root and crest of a flat die, on the other hand, travel at the same surface speed. It is for this reason, incidentally, that circular dies must be made smoother than flat dies.

Because of the better surface produced in the profile of the thread, greater torque is required to drive a rolled thread product. The smooth surface of the rolled thread profile presents a flatter bearing and consequently a greater friction surface to the material into which it is being screwed. Furthermore, the torque is more uniform than on die cut studs. The reason can be found in the sketch, Fig. 3, taken from a photomicrograph of a cut thread in hard material at 100 diameters. By comparison, a Class A rolled thread appears geometrically perfect, with straight flanks.

General Requirements

In judging the requirements of a material from the point of view of ease or difficulty in thread rolling, a number of factors must be taken into account. Generally speaking, where

FIG. 4—Tube feed and stock hopper simplify hand feeding of aircraft stud blanks to a straight die machine. It is only necessary for the operator to keep the tube filled with blanks, which are released one at a time at the start of the stroke.

Photo courtesy Chevrolet Motor Div. of General Motors.

Hardness should be correlated with the ultimate strength in estimating rollability. For example, an SAE 6150 steel stud treated to a hardness of 28 Rockwell C and an ultimate strength of 135,000 lb. per sq. in. is not equivalent in rollability to SAE 3140 steel heat treated to a hardness of 32 Rockwell C and 155,000 lb. per sq. in. ultimate strength. The same average die life could not be expected in both cases.

Although threads can be rolled in any material capable of plastic deformation and in any thread form except a square thread, in aircraft work the alloy steels most frequently encountered in bolts and studs are the following:

SAE 2330	NE 8630
SAE 3135	NE 8635
SAE 3140	NE 8740
SAE 4027	AMS 6312
SAE 4042	AMS 6320
SAE 4640	AMS 6322A
SAE 6150	AMS 6448

In other applications high tensile wire (100,000 lb. per sq. in.) has been rolled for instrument fasteners, also AISI 303 stainless steel (18-8) and AISI 416, 14 per cent chromium steel. For some 35 years a thread with a lead error limited to 0.0001 in. per in. of thread has been rolled in 1 per cent carbon tool steel in the manufacture of the Reed micrometer spindle screws. Commercial carbon steel taps have been thread rolled for a number of years, particularly in the smaller sizes, but rolled taps for threading work to Class 3 and Class 4 fits invariably have the thread flanks ground after rolling.

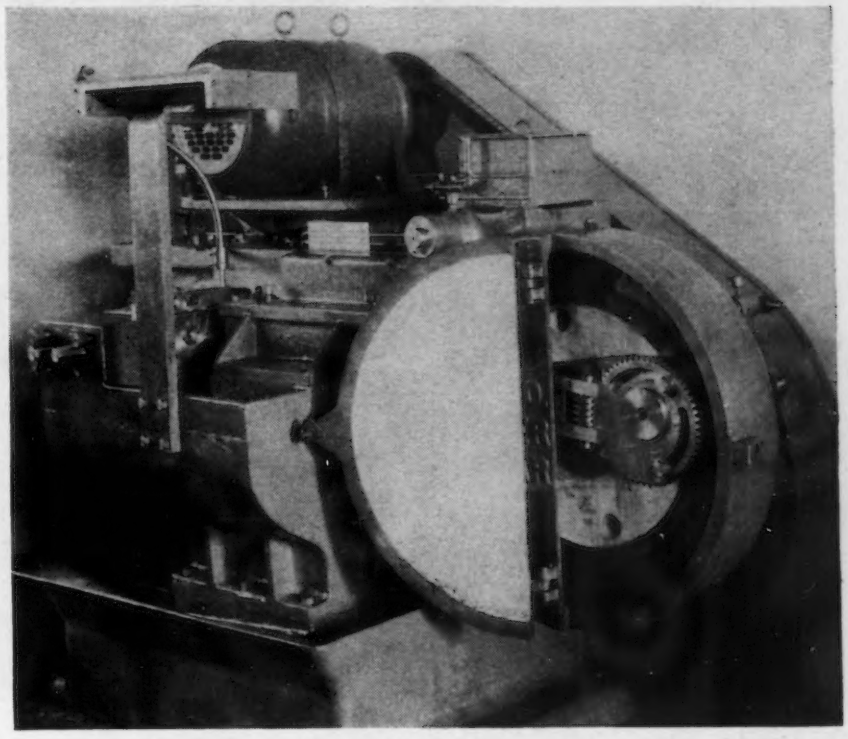
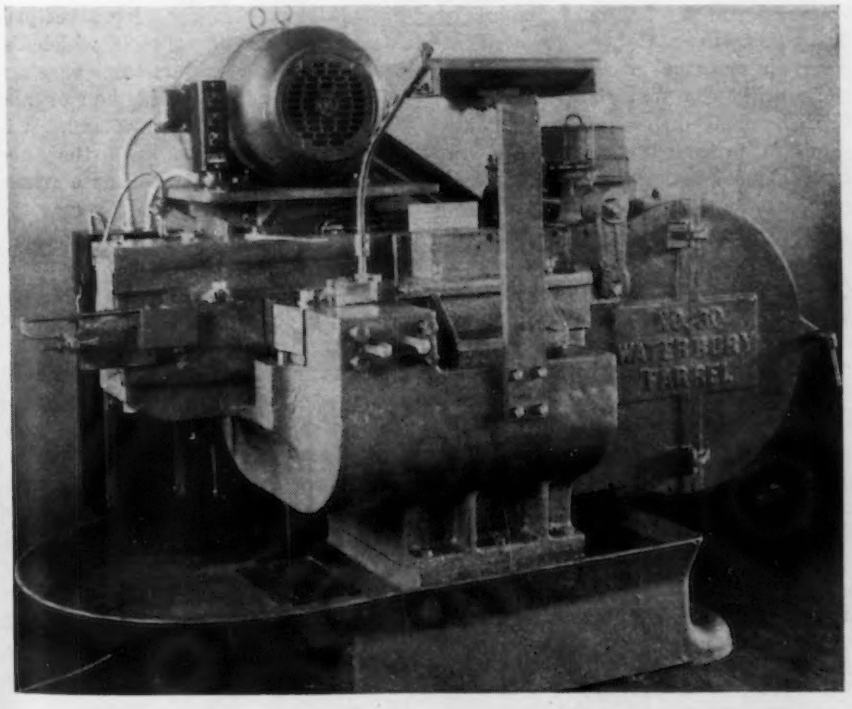


FIG. 6—Use of an eccentric sleeve rotated by worm and wheel on the crankpin of the driving gear provides a means of setting the moving die forward or backward and dispenses with the use of filler shims under the fixed die. This is an optional feature on Waterbury-Farrel thread rollers.

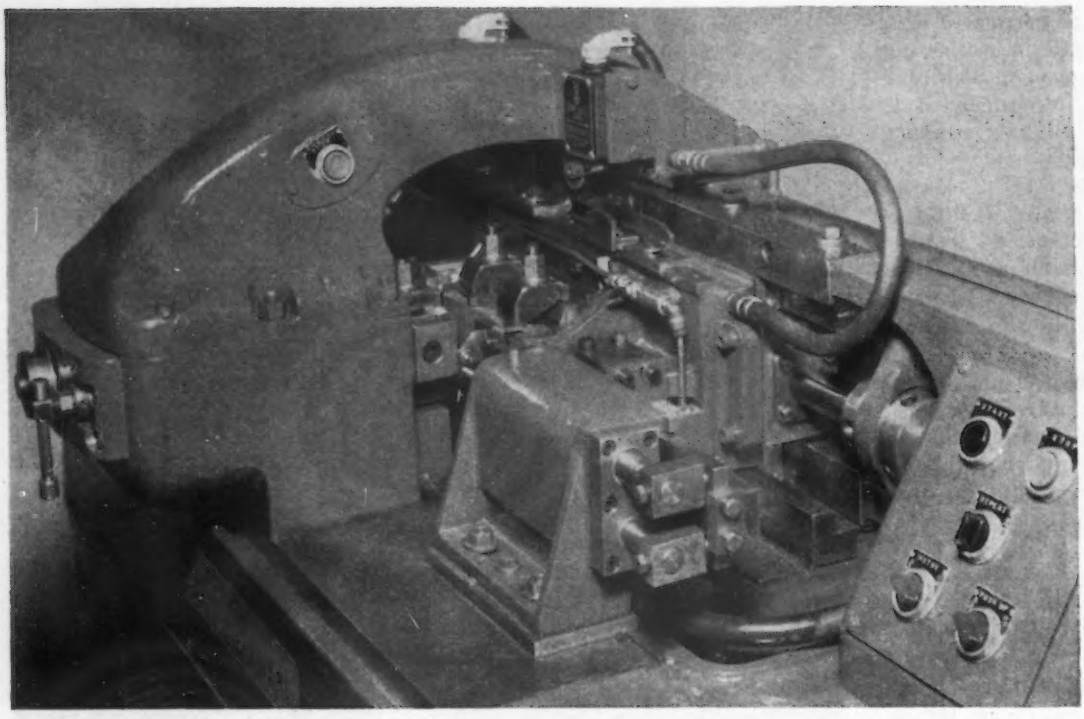
On aircraft work, the range of thread sizes runs from ⅛-32 thread to ½-13 thread studs. Some wing hinge bolts are being rolled in annealed SAE 3140 up to a diameter of ¾ in. In the annealed state the upset and extruded shanks have a hardness of 24 Rockwell C which is raised to 38 Rockwell C when heat treated, with an ultimate tensile strength of 175,000 lb. per sq. in. Parenthetically, it should be noted that in the few instances where annealed stock is rolled and later heat treated an allowance must be made for expansion of the p.d. of the thread of 0.0005 in. for a ¾ in. thread diameter.

FIG. 5—Adaptation of a tube feed with selecting gage at tray for orienting studs end for end on a Waterbury-Farrel No. 30 thread roller adapted for precision work.



Many aircraft studs and bolts are plated, principally with cadmium. Thickness of plate, which is in the order of 0.0003 in. must be taken into account in that the p.d. of the as-rolled blank must be undersize. After plating the screws are heated to 300 deg. F. for about 3 hr. to prevent hydrogen embrittlement.

As in any type of precision work, success or failure depends on observing a large amount of infinitely small detail that is often overlooked in commercial work, that is, work turned out fast to meet a fixed market price. In fact, some feel that so much care must be exercised in the rolling of precision threads that they see no extension of the process to, let us say, automotive bolts and studs after the war. There is plenty of evidence on the contrary to indicate that by the war's end, the techniques about to be described should be so well established that rolling bolts to Classes 3 and 4 fit tolerances will be considered no more difficult than rolling to Class 1 fits today. The chief modifications in the process



LEFT

FIG. 7 — Close-up view of the National Electric Welding Machines Co. thread roller, showing the hydraulic ram cylinder at right, hydraulic pressure head for the fixed die at left and bridge structure designed to prevent dies springing apart. Stock pusher mechanism is in central foreground.

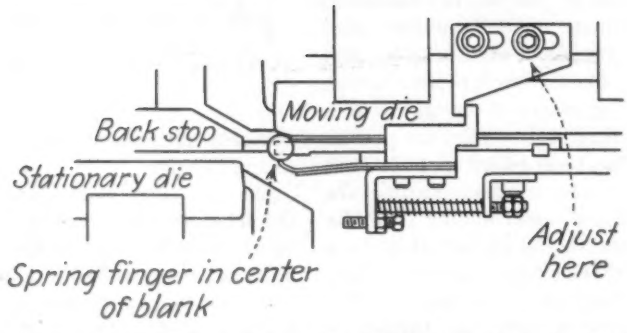


FIG. 8—At the start of the stroke on the National machine the blank is held positively between the end of the moving die, the feed bar, a spring finger and a backstop fixed to the moving die.

are the use of dies of extremely accurate thread forms and finish and the control of the blank diameter within close limits. First experiments used two sets of dies to obtain a precision thread, the first being a roughер. This follows the practice of making micrometer spindle screws, still done in two steps to get a lead accuracy not yet approached in aircraft work. As the practice became better known, however, most aircraft work was and is rolled to final dimensions in one pass.

Before covering some of the critical details of the process, however, it will be necessary to review the available classes of thread rolling equipment now on the market since the characteristics of the machines vary widely. Several new types have appeared in the past year and others are about to be introduced.

Reciprocating Type Machines

Thread rolling machines may first be classified as to having either flat dies or circular dies or rolls. Reciprocating types of machines incorporating flat dies have been in existence at least since 1851. In this country records show that considerable thread rolling was being done in 1880 on such units. During this period the two main suppliers of this type of equipment were the Waterbury Farrel Foundry & Machine Co. and E. J. Manville Machine Co., both of Waterbury, Conn. Although many Manville thread rollers are now in use, many of them doing high precision work, within the last year the company has disbanded and sold all its patents and drawings to the National Machinery Co., Tiffin, Ohio. For the present, the Manville machines are off the market.

Basically the Waterbury and Manville hand feed horizontal machines used for precision work are alike in that they are both geared crank driven machines having one die mounted on a reciprocating slide or gate and the other fixed to the bed of the machine in such fashion as to be adjustable both up and down as well as in and out and as to angularity with respect to the face or plan of the moving die. Both machines employ a cam actuated starter finger or pusher which literally jams the blank in between the dies at the start of the stroke. Although in commercial work automatic feeds are by far the more common, in high precision work feeding of these straight die machines is almost invariably by hand. For one thing, the speeds are one-third to one-half the rated speed when hard materials are being rolled. Fig. 4 shows a semi-automatic type of feed for a reciprocating type thread roller in which the stud blanks in this particular case are lifted by hand from the hopper and dropped down the tube by hand. It is merely necessary to keep the tube filled with parts inasmuch as a transfer finger moves the stud over to the work position on the return stroke.

Another type of semi-automatic chute feed built into a Waterbury Farrel unit is shown in Fig. 5. Such chute feeds are applicable only to studs. Inclined type machines with hopper feed and the conventional type sweep to pick up cap screws and bolts are generally not used for precision work. The few that are installed in plants making aircraft screw products are turning out Class C commercial screws for non-critical applications.

Fig. 5 also shows the use of an auxiliary stop and holding device for keeping blanks square with leading edge of moving die (not shown in

place). With the blank held between this stop and the pusher, tipping is prevented when the blank is started into the dies and the development of "drunken" threads avoided, particularly on long bolts.

Another recent feature available on Waterbury Farrel machines for precision work is an adjustable pitman for driving the moving die ram or gate. It cuts in half the time of setting up and matching the dies, according to some users. The mechanism comprises an auxiliary eccentric sleeve on the crankpin, Fig. 6. This sleeve is rotated by means of a worm and wormwheel to change the relative position of the eccentric and hence the starting position of the gate. Because of the fact that the helix angle of the average thread and hence of the die grooves is roughly 3 deg., or a slope of 30:1, any longitudinal adjustment of the moving die is 30 times as sensitive as would be the insertion of shims under the fixed die to adjust it vertically with relation to the moving die, in matching the pair.

National Hydraulic Unit

Within the last year, the National Electric Welding Machines Co. of Bay City has introduced a reciprocating type thread roller for precision work, in which the ram motion is actuated by hydraulic power through a cylinder and piston connection. What is even more significant from the operating point of view is that the stationary die is mounted on a hydraulically actuated pressure head, Fig. 7, with stops governing the depth of infeed. A hydraulic piston applies pressure to the blank as it is rolled between the dies. This is the only straight type machine incorporating a definite feed movement: most others rely upon a slight angular setting of the dies in conjunction with allowance for spring in the frame of the machine and hence the reacting pressure to govern the depth of penetration of the dies per contact or full roll. As will be seen later, some dies are designed with a lead-in angle to accomplish the same effect.

In general, the use of hydraulic power is said to provide a cushioning effect in that the hydrostatic pressure on the ram can be preset so that the movable die will assume a speed in conformity with the pressure exerted by the ram and with the yielding or workability of the screw stock; that is, on very hard materials the ram will automatically slow up without increasing the hydraulic pressure in the system. This maximum pressure is normally 400 lb. per sq. in.

On these same machines, made in two sizes, a bridge structure, Fig. 7, is used to tie the fixed die bed and the ram backup casting together so as to minimize deflections due to the extremely heavy pressures generated by the cold working action on the stock.

Another feature of the National machines (not to be confused with cold headers and threaders made by National Machinery Co., Tiffin, Ohio) is the mechanism for placing the blank between the dies at the right time. The dies are set up so that at the beginning of the stroke the space between the dies is slightly less than the blank diameter, so that the initial squeeze will start rolling the blank between the dies at the same position for each operation. Governing the hydraulic pressure on the pressure head determines the infeed rate of the stationary die from the point of application of this pressure. Cams on the reciprocating main slide govern in turn the time at which pressure is applied, usually when the dies have overlapped 2 to 3 in. Pressure is removed when the overlap at the rear end of the fixed die is 1 to ½ in.

As can be adapted to other types of straight die machines a back stop blade locates the blank at the end of the moving die so that the same amount of squeeze is applied to each side of the blank when the die corners cross and the blank begins to roll. The blank is inserted manually into a nest, Fig. 8, and is held by the flat spring finger against the back stop blade, the relief surface at the end of the moving die and the feed bar, which is actuated by a coil spring with hydraulic reload. As soon as the blank starts rolling the feed bar is retracted and the back stop blade pulls away at twice the speed of the blank advance as in conventional machines.

In one other important respect the National unit differs from older types. Matching of dies is accomplished by adjustment of the moving die instead of the stationary one. The die itself is clamped in a saddle block, Fig. 9, which in turn is mounted on two adjusting wedges and a rocker—one wedge and the rocker in back of the saddle block and the other wedge beneath it. The latter corrects for ver-

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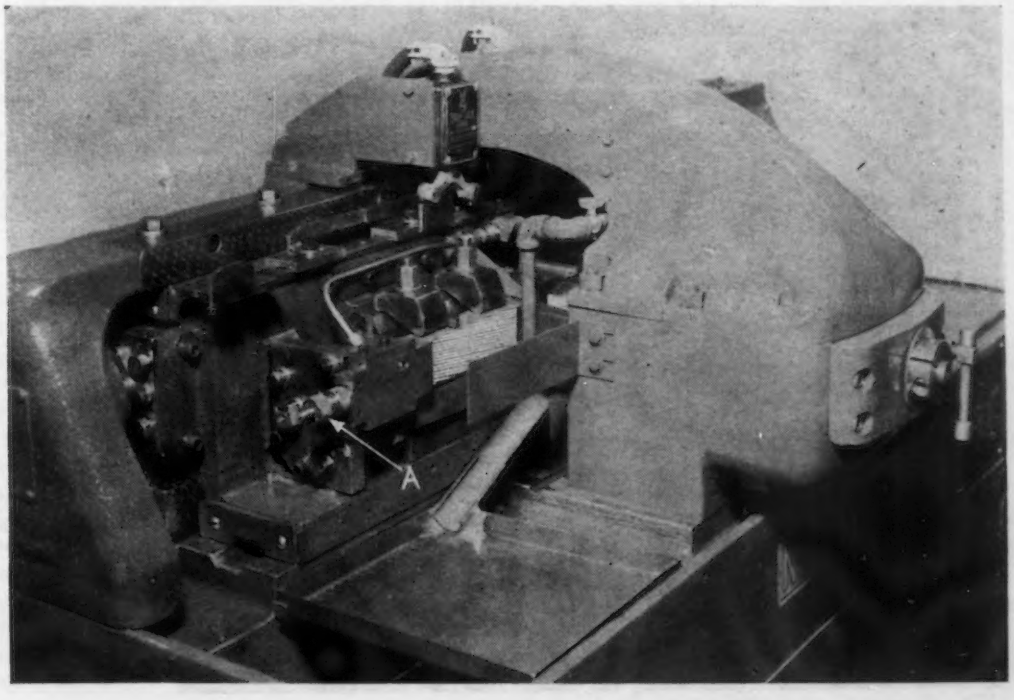

FIG. 9—Front view of the die ram on the National hydraulic threader. The moving die may be tilted from a vertical plane to correct thread taper or raised or lowered for die alinement by means of the taper wedge adjusting screws seen at the end of the ram. Adjusting nut A controls the start position of the screw blank.

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tical elevation alinement of the dies. The former two enable the die face to be tilted, providing accurate control over the taper or parallel requirements of the thread being rolled. In some cases it is desirable, for example, to roll a thread having a slightly smaller pitch diameter on the end than nearer the head of the bolt. Compound screws on the taper wedges make these adjustments very sensitive. Matching is done in the conventional manner by running the blank through the dies a half turn and observing the impressions made by the stationary and the moving die. By placing a pencil mark on one side of the blank, the impressions can be identified and the adjustment of the moving die, up or down, made accordingly until the impressions match at the half turn.

As mentioned earlier, the idea of rolling threads with circular dies is not new. The first commercially practical machine, however, was not put on the market until about a year ago. This machine, known as the Reed cylindrical die thread roller, Fig. 10, is made by the Rolled Thread Die Co., Worcester, Mass., one of the largest producers of flat type dies for reciprocating type machines as well. The principle of the Reed thread roller is based on three constantly rotating cylindrical threading dies, Fig. 11, which act simultaneously on a blank floating between them. The thread is formed without shock by controlled pressure applied through the action of toggle arms which are moved in and out by oscillation of a stress ring, the movement of which in turn is controlled by the action of a cam and link with spring return.

An advantage of the Reed machine is that the feed can be varied by changing the shape of the cam and by change gears so as to provide the equivalent of a straight die many feet in length, since the rolls may rotate many revolutions, the only limit being economy of operation. Thus on hard materials the infeed may be very gradual. For thin hollow work, for example, to which the machine is well adapted, it is possible to feed in the dies very slowly, equivalent to the action of a flat die 14 ft. long. With this unit, soft tubing has been threaded with 0.025 in. left between the bottom of the thread and the bore of the tube. In ordinary straight die work where two contact points are involved, on a 16 pitch thread, for example, the reduction per contact varies between .0.015 in. at the start and 0.001 to 0.002 in. at the end, since the dies must be set up nearly parallel in order not to squeeze too hard on the finished end. In the Reed circular die machine, on the other hand, the penetration per contact can be controlled throughout the cycle to any desired amount. In practice, however, it is customary not to exceed 0.005 in. on the first contact and to reduce penetration per contact throughout the cycle until at the end several revolutions are used without penetration to iron out irregularities.

In the earlier Reed machines considerable time was taken in matching the three circular dies. Although accurate results could be obtained, comparatively in accessible adjustments of the three rolls complicated the situation. In the latest approved model two of the die driving members may be rotated with respect to each other and the third fixed member, by means of an internally serrated sleeve having 101 teeth with dial markings on the outside corresponding to the serrations. The sleeves may be raised and the dies rotated to correct for lead error in terms of per cent of lead. The rolls are set by taking a light (0.005 in.) bite into blank and rotating the dies by a handwheel on the change gear shaft one-third turn to match up the grooves. Fig. 12 shows the appearance of mismatched and properly matched dies by their effect on the grooves. In the new Reed unit,

FIG. 10—The Reed cylindrical die thread roller feeds three rolls into the work by toggle action. Shown below at A is the toggle die holder assembly partially removed. At' the toggle joint is clamped to the stress ring, while at A'' is the universal joint drive. Scroll faces B on inner surfaces of stress rings are for major adjustments of pitch diameter of work, while screw link C is for minor p.d. adjustments. Cam D governs infeed. Under plate G is oil filter. In the upper view of the whole machine at E are the multiple splined shafts with sliding collars used for synchronizing dies. Change gears are at F.

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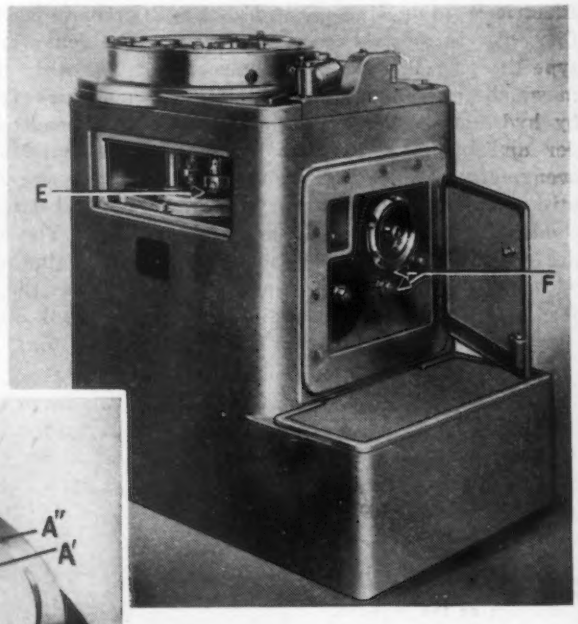

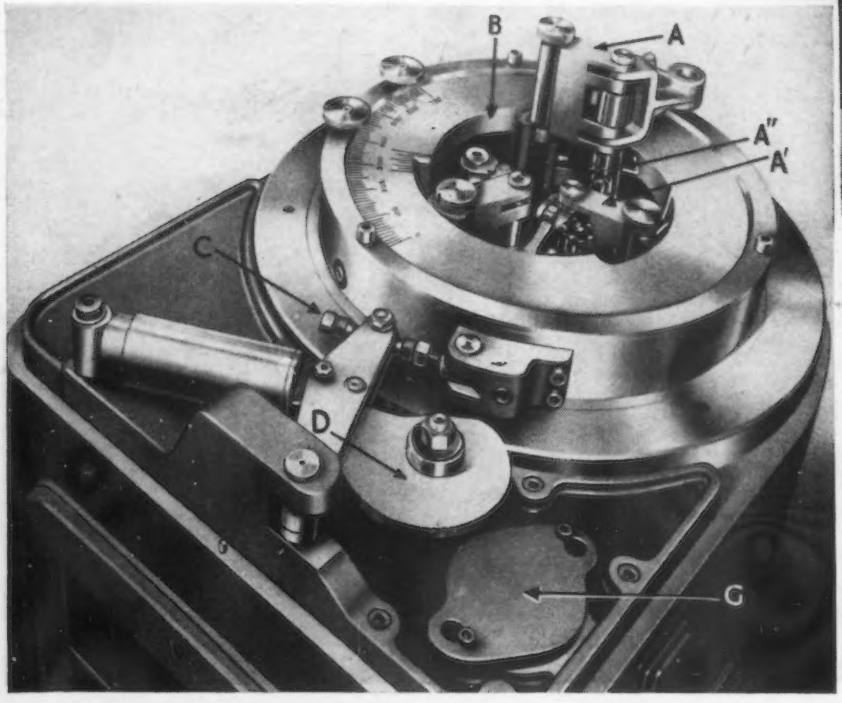

substitution of a right and left hand thread connection between the cam actuated pivoted link and the oscillating head also facilitates the setup. When this link is lengthened, the toggle joint will not reach dead center and the p.d. of the work is slightly increased. This adjustment is exceptionally accurate and sensitive.

The dies of the Reed thread roller are ground accurately as to thread contour on standard thread grinders. Dies vary in size from 1 to 3½ in. in diameter, Fig. 11, the exact size being a multiple of the pitch diameter of the screw being rolled.

The Reed unit is not a high speed machine. It is designed specifically for precision work and for handling parts that would be difficult to roll on straight reciprocating type machines. Where a reciprocating type machine might bat out 60 bolts per min. on commercial work and from 20 to 30 per min. on high strength aircraft material, the Reed unit will average 12 to 15 per min.; although it has produced as high as 26 pieces per min. on some aircraft material. One of its principal applications is to long studs that are top heavy. Unless positioned exactly vertically in a straight die machine, such parts are likely to be produced with drunken threads, with disastrous effects on the die. In the Reed machine the three rolls tend to center the work and keep its axis vertical while it is being spun.

Circular die machines are also well adapted for threading hollow work and for rolling taper threads, including pipe threads and aircraft studs with lead-in threads. The controlled feed feature of the Reed unit is advantageous in this respect in that

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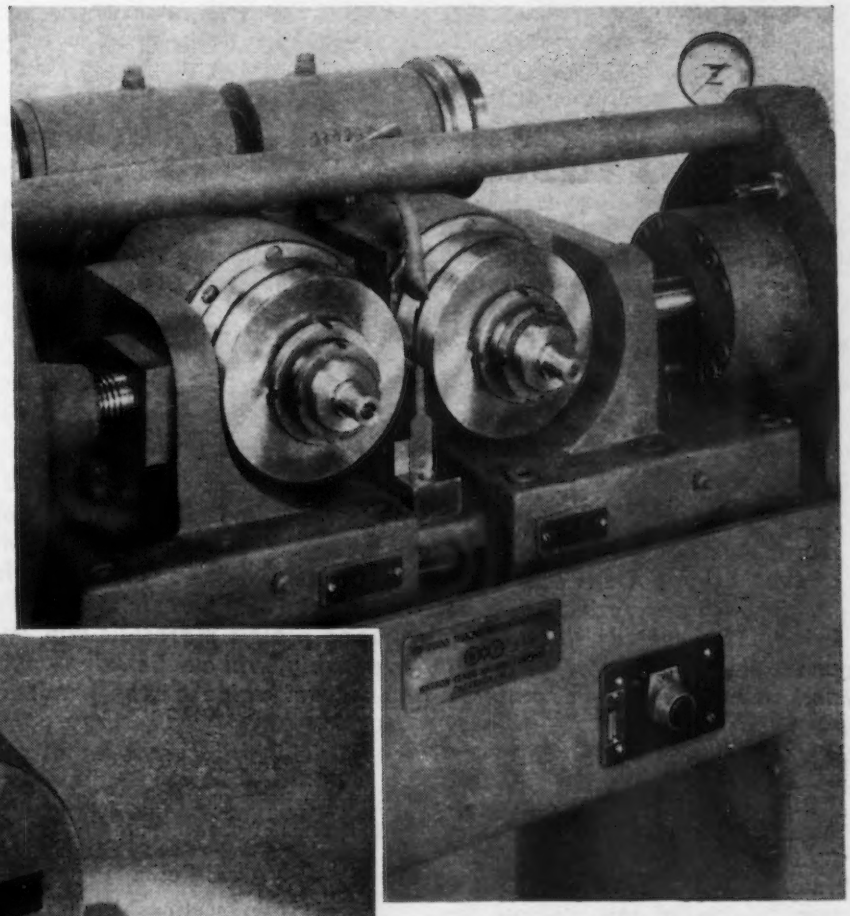


FIG. 13—The Watson-Flagg thread roller incorporates two high speed steel circular dies about 6¼ in. in diameter and having threads with about 15 "starts" ground in them. The right hand die is fed into depth by hydraulic pressure.

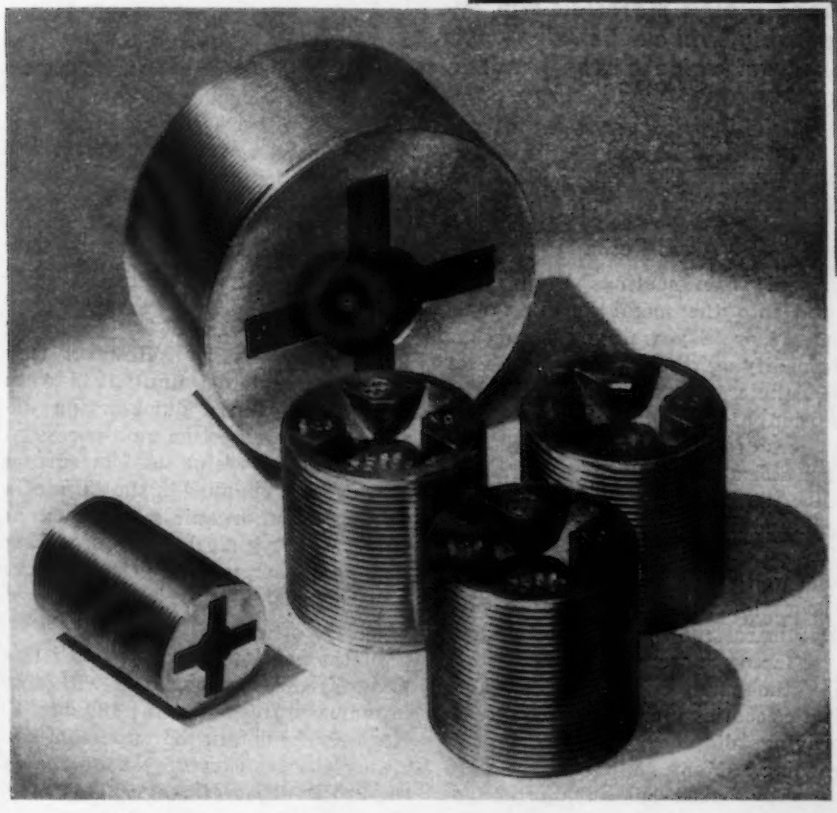
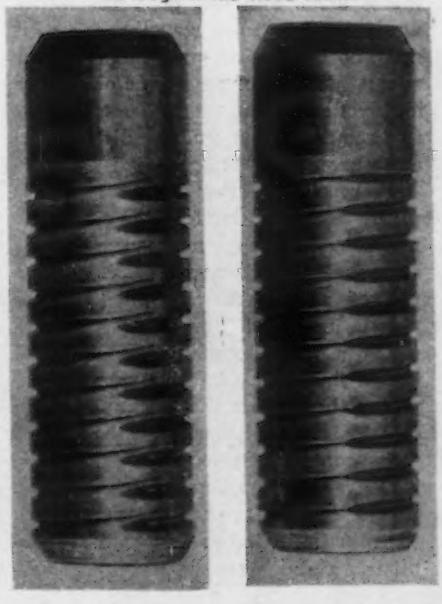


FIG. 11—Set of RTD cylindrical dies. Varying from 1 to 3½ in. in diameter, these rolls have thread forms ground from the solid in high speed steel or high carbon, high chrome steel.

BELOW

FIG. 12 (Left)—Screw thread partially rolled by mismatched dies. (Right) With properly matched dies, the impressions made by one die will accurately aline with those made by the other when the blank has rotated the first 180 deg. in a straight die or the Watson-Flagg machine and 120 deg. in the Reed roller.



Plastic Coatings For Metals

By CHARLES DELMAR TOWNSEND
Process Engineer, Cleveland

. . . Plastics can and will play an important part in the coating of metals. The author points out that during the war the development of synthetic coatings has advanced considerably and further rapid strides will be made in the postwar period when restrictions are lifted. This use for the newly developed plastic materials will improve the surface of the metal considerably, will cut finishing costs and will increase the salability and market value of the product.

IN 1855 Alexander Parkes began manufacture of a varnish-like material produced from cellulose nitrate, gums and a plasticizer. However, the use of this material was delayed until John Stevens developed the use of amyl acetate as a solvent in 1882. Later through the addition of pigments this material became well known in the metal coating industry. The lacquers made from cellulose nitrate are not affected by common aliphatic hydrocarbons and their derivatives but are completely soluble in acetone. These lacquers will dry readily at room temperature but generally the metal parts are processed by forced drying at 150-180 deg. F. The coating is only mildly attacked by dilute acids and has good resistance against water and gasoline. Yet it does not stand up under salt water spray, alcohols or vegetable oils. It is highly flammable and has a tendency to become brittle and to discolor on exposure to excess light.

Nitrocellulose coatings can be applied to metal surfaces by several methods. The most common method is spraying. This is accomplished by the use of air pressure applied to the plastic material, forcing it through the gun and atomizing the material into a fine mist. Another way of applying the lacquer that is employed on metal signs and sheets is the use of roller coating. Other methods of coating are by dipping and tumbling. Products that have been surfaced with this plastic include refrigerators, furniture, metal signs, bedsprings, radiators, buckles, hairpins and many other items of prewar manufacture.

Alkyd Resins

Alkyd resin coatings were introduced into the metal finishing field some 15 or 16 years ago as a means of modifying the characteristics of the cellulose nitrates lacquers. The addition of most types of resins to lacquers resulted in cracking and other difficulties while the use of alkyd resins improved the weather resistance and appearance.

In the early 1930's alkyd resins became well established in the industry of metal coating. The automobile, agricultural and industrial machinery manufacturers were the first to recognize the many advantages. These plastic coatings can be applied by spraying, dipping, roll coating and brushing. Many applications were originally baked but during the period just prior to Pearl Harbor the industry began a gradual change-over from this to air drying since increasing numbers of items could not be baked even with infra-red lamps due to the large sizes involved.

The shortages of various materials and the need to meet certain definite Army and Navy specifications has caused many improvements to be made in this type of coating. Alkyd resins have been employed to prevent chalking in the lusterless finishes for war use. They are being used in the coating of aluminum and light metal parts to prevent corrosion. Since this plastic has not been available for civilian consumption during the war, no doubt its use will be expanded in the postwar era. The experience gained in the past several years will help improve the application in the coating of metal in the years to come. It is a durable plastic and has good flexibility but is soluble in hydrocarbons. The probable use in the postwar era will be for coatings used on automobiles, farm equipment and trucks.

Melamine Resins

In 1939 the melamine resins were made commercially available in the United States. Their existence was known as early as 1834 when Liebig produced the material. However, they were not exploited until 1939 when the demand for a quick-drying durable finish was becoming a necessity. The melamine resins used in surface coatings are supplied in the form of a solution in an organic solvent such as butyl or octyl alcohols. Since these resins are thermosetting they produce a hard finish by the application of heat.

In the coating of metals with this material the surface finish will bake in temperatures as low as 180 deg. F. However, to obtain the maximum efficiency the temperature should be in the 325 to 425 deg. range. This coating has not been extensively applied in the civilian goods industry except for the early use in coating refrigerators and metal furniture. Developments during the war have improved this particular coating and it will doubtless have an important future in the postwar era of metal finishing. It is far less affected by water and light than many other coatings and could well be used for hospital equipment, bathroom cabinets and other furnishings that require white color and durability to water cleaning and light.

Digressing slightly from the metal coating industry, it should be noted that the building trades during recent

years have been making good use of coumarone-idene resin. This material is based on developments by Kraemer and Spilker and dates back to 1890. The coumarone-idene resins will blend readily with other resinous compounds as well as with waxes and bitumens. Here again the plastic coating has gone to war and the most recent developments will become known and used in the postwar period. The coating is effective on ship painting and on the coating of concrete installations where it prevents dehydration of the cement and eliminates the possibilities of a faulty cure. The coumarone-idene resin is highly resistant to acid, alkali, brine and water.

Acrylic Resins

Acrylic resins have played an important role in wartime coatings, and developments in the past year are reported to be remarkable, although they too must wait for V-day. These resins were developed in 1901 by Dr. Otto Rohm of Darmstadt, Germany, and in 1930 the Imperial Chemical Industries, Ltd., introduced them to England. The suppliers to the United States were also working along similar lines and the war demands of 1943 have caused rapid strides to be made in the development of this coating. The acrylic resins have a water white color and transparency. They are highly resistant to mineral oils, alcohol, vegetable acids and chemical fumes.

One difficulty with acrylic resins is the pinholes that often occur but this can be overcome to a certain extent by use of the proper solvents. Developments of this resin that have taken place recently will prove advantageous in the postwar fields. The resins can be applied by the spray method using 15 to 18 per cent solids. Both dipping and roller coating can be employed also.

Phenolic Resins

Phenolic resins have been rapidly developed for wartime use and the armed forces have used this coating on drinking water tanks, steel canteens and hospital food containers. The oil - soluble thermoplastic phenolic resins are being restricted for war use and the great demand for an anti-corrosive primer is being met by the use of this material. The reduction of tung oil has greatly increased the value of this type of coating.

Another oil-soluble resin, but one that is thermosetting, is also being used on parts requiring resistance to acids. It forms a hard, glossy coating and has good dielectric properties. This coating is now being used in place of stainless steel and is being applied to many containers.

The phenolic resins can be applied, as can nearly all the plastic coatings, by the use of spray guns, roll coatings or dipping methods. Some types of thermosetting phenolic resins can be baked while others require the use of a drying oil which will set up without heat.

Postwar uses of this material are numerous and will doubtless include coatings for tank car linings, drum linings, cans and other similar products. Phenolic coatings are very flexible and durable.

There are many other plastic materials such as styrenes and the vinyl and urea resins that will invade the metal coating and finishing field to improve the surface conditions of steel and other metal items. When the day of victory arrives the tremendous developments that have been made in these past few years will assist in the perfection of better metal coatings.

Engineers will find that they can avail themselves of the strength and durability of steel and yet sacrifice nothing since the plastic coatings will enhance the appearance and serve to place the metal products in the competitive field with plastics.

Surface Inspection by Projected Plastic Film

FAXFILM is the name given the latest method of surface inspection and comparison. The process is simple. By the use of a solvent, one surface of a clear plastic film is softened enough so that when pressed onto a surface a contact replica is produced. This film is then mounted in a 2 x 2 in. cardboard frame and placed in a standard projector such as is used for Kodakrome transparencies. Enlargements of 100 diameters or more can be made on the screen.

One use for Faxfilm is in the metal working industry where samples of machined surfaces must be compared for quality control. It is also useful for studying crystal structure and for demonstrating the quality of fibers such as wood, cloth and paper. The film is said to be indestructible by heat of the projector and is resistant to acids and alkalis. It is non-inflammable.

Surface contours are seen in three dimensions since variations in the thickness of the film causes a variation in the amount of light which penetrates the film. Comparisons for standards for roughness, waviness and lay can be made. Cleavages, cracks, porosity, dents, tool marks and other scratches are also revealed.

To make a plastic print, 1 in. of the film is cut from a roll and is pressed on the surface to be examined after the latter has been moistened with the solvent. After being left on the surface for from 30 to 60 sec., the film is stripped from the surface and mounted in the frame, which has been moistened on the inside. The slide is then ready for projection.

Faxfilm is available from the manufacturer, R. D. McDill, 5109 Mayfield Road, Cleveland. It is sold in inexpensive kits with sufficient materials to make 250 plastic replicas. The film can be filed for future record if desired.

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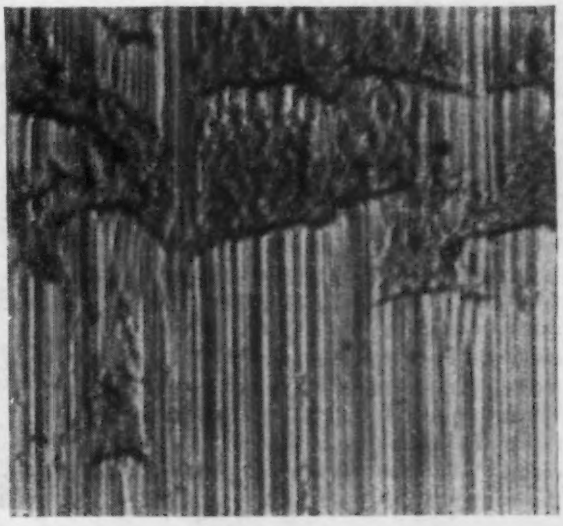

FAXFILM of a machined steel bar, finished to 250 microinches RMS, showing waviness and lay. Enlargement 100 times. Projected reproductions of surfaces cost about 6c. each in small quantities.

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. . . A Measuring and Designating

WHEREAS the measurement of surface roughness is a complicated procedure requiring fine precision instruments and specially trained personnel, the comparison of surfaces so as to determine rapidly which surface is the rougher, is a simple matter. Surface comparison can be accomplished without use of expensive equipment or specialized techniques.

Roughness comparison is an all-important factor in expediting and controlling the production of surfaces. Shop personnel are called upon to make such comparisons throughout the various stages of production, assembly and inspection.

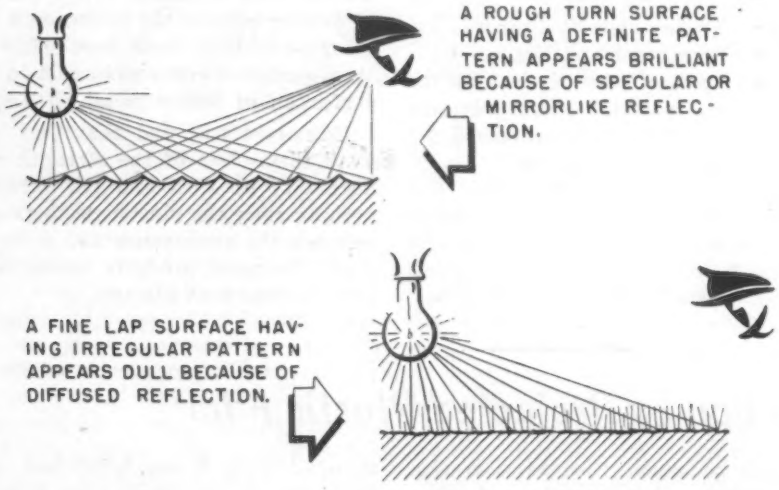
Surface roughness comparison is predicated upon accepted roughness standards, extensively distributed, which serve as liaison agents to advise the machinist as to the limitation the engineer has placed upon the roughness of a part. Roughness standards are nothing more than limiting values; they do not represent requirements for duplicating roughnesses. Thus, through the comparison of surfaces, the machinist is able to make certain that he is staying within those limits.

As an example, a drawing calls for a 40 RMS microinch finish on a machined part. What has been specified by the designation is this: the part must have a 40 RMS microinch roughness, or smoother. There is considerable leeway below the 40 value called for, but none above; the surface must not be rougher than the value specified. In those rare cases where too smooth a surface would be unsatisfactory, two values are specified and the final roughness produced must lie between those limitations.

Comparisons by Touch

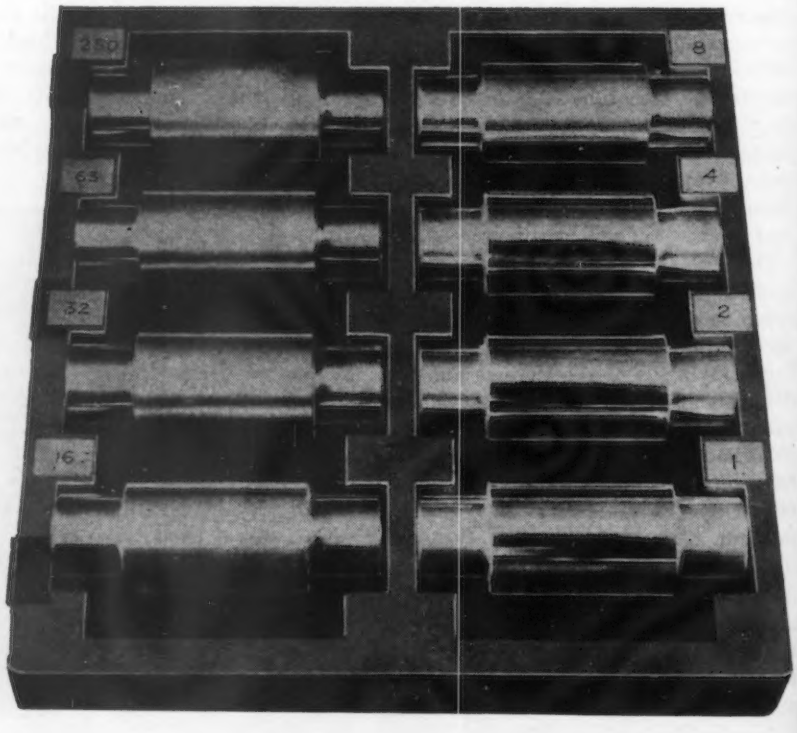
Although comparisons can be made by sight, feel or instrument, comparison is essentially a tactual procedure. Visual inspection cannot be depended upon. The prevalent idea that the brighter a surface appears the smoother is its finish, is definitely a misconception. It is very possible that a turned steel cylinder with the RMS value of 250 microinch or more will shine brightly, while a ground and lapped valve with a finish of about 5 will be gray, dull and lustreless (see Fig. 16).

However, the difference in the roughness of those two surfaces can be made immediately apparent by merely scraping the fingernail over the two surfaces. In addition to detecting such obvious differences, fingernail comparison is valid in determining minute differences within the critical range. It has been clearly proved that through touch, even inex-


A ROUGH TURN SURFACE HAVING A DEFINITE PATTERN APPEARS BRILLIANT BECAUSE OF SPECULAR OR MIRRORLIKE REFLECTION.
A FINE LAP SURFACE HAVING IRREGULAR PATTERN APPEARS DULL BECAUSE OF DIFFUSED REFLECTION.

ABOVE

FIG. 16—Illustrating reason why visual inspection cannot be depended upon to make surface comparisons.



BELOW

FIG. 17—Norton Co. standard surface specimen set consisting of eight ground steel samples.

Surface Finish

By JAMES A. BROADSTON
Armament Engineering, North American Aviation, Inc., Inglewood, Cal.

. . . Reviewed in this last of a three-part article are methods of comparing surface finishes, including a description of a new low cost comparison roughness gage made of plastic, which promotes surface quality control not only in the plant machine shop but also among parts suppliers scattered over wide areas.

perienced personnel can make roughness comparisons both rapidly and efficiently.

On this basis, that fingernail comparison is effective and rapid, the problem of controlling surface quality in production becomes one of providing precisely accurate surface roughness specimens — specimens truly representative of surfaces having measured and known degrees of roughness—to the machinist, the tool designer, the inspector, the assemblyman and others responsible for the control of surface quality.

Standard Surface Specimens

Various companies have developed different types of commercial standard surface specimens. The sample sets of the Norton Co., the University Machine Co., the General Electric Co., the United States Rubber Co. and Lockheed Aircraft Corp. will now be described.

The standard specimen set of the Norton Co., Worcester, Mass., Fig. 17 consists of eight ground steel samples which follow the American Standard micro-inch values. This company also produces a set conforming to National Aircraft Standard roughness values from 2 to 100 microinch, including two blank specimens that may be finished to any desired roughness by the purchaser. All of the Norton specimens are measured with a Profilometer, and the accepted tolerances are within plus or minus 15 per cent of the standard.

The University Machine Co. Division of Baird Associates at Cambridge, Mass., has done considerable research in the field of surface finishes, and has manufactured 500 sets of surface finish samples for the Army Ordnance Department. This set, Fig. 18, consists of 23 stainless steel sample blocks representing various machined surfaces ranging from 4 to 500 microinch RMS following the American Standard preferred values. The specimens are guaranteed to be within 10 per cent of the standard roughness value as measured by the Profilometer.

FIG. 18 — Surface finish samples manufactured by the University Machine Co. for the Army Ordnance Department.

ABOVE
FIG. 19—Plated replica specimens in stainless steel developed by General Electric Co.

The General Electric Co., Schenectady, N. Y., pioneered the use of a complete set of machined stainless steel surface roughness samples following the American Standard from 4 to 1000 microinch. The set shown in

Fig. 19 is a recent development; it includes 25 surfaces produced by lapping, grinding, turning, milling, and endmilling. The smoother surfaces are measured with the Profilometer, and the rougher ones (beyond the range of tracer point accuracy), are measured with a special profile recorder. The specimens lie within a tolerance of minus 20 and plus 5 per cent of the nominal average value of surface deviation in micro-inches, without regard to wave length for all wave lengths up to and including ½ in.

The United States Rubber Co. electroforming department, under the direction of Dr. E. H. Wallace, has developed a set of replica surfaces reproduced on a 3/32-in. electroformed iron plate having a corrosion resistant face of nickel or chromium.

These sets, called Ekko Comparators, Fig. 20, are created by electrodeposition; no mechanical operations or machining are necessary. Extremely accurate negative impressions are made from master surfaces selected on the basis of Profilometer readings. Heavy electroformed deposits are then plated upon the negatives; when separated from the negatives, the deposits yield a duplicate of the original machined surface.

The Ekko Comparators contain 18 representative standard surfaces and are available in two sets; one follows the American Standard values and the other the SAE standard values. The former set, for ordnance work, ranges from 2 to 500 RMS microinch; the latter, for aircraft, ranges from 3 to 200 RMS microinch.

The Lockheed Aircraft Corp., Burbank, Cal., has developed a set of surface roughness specimens consisting of six aluminum-alloy samples mounted in a small cardboard holder (Fig. 21). The surfaces are made from anodized 61 SW passed under rollers which have been roughened to produce replicas of ground surfaces corresponding to RMS value of 10, 20, and 40, and turned surfaces of 100, 250, and 500 microinch as measured by the Profilometer. The Lockheed specimens are relatively inexpensive.

Such sample standards serve an important function in surface control, but in general, their cost limits their distribution. The Norton Co. and the University Machine Co. surface roughness specimens are machined originals difficult and costly to produce. The U. S. Rubber and the General Electric specimens, being duplicates of the original masters, are less expensive. Without widespread distribution of a roughness comparator to all associated stations throughout a plant, a comprehensive and efficient program of surface roughness control cannot be attained.

In dimension control, it is entirely satisfactory to establish a master set of gages in the chief inspector's office, where all working gages and micrometers can be brought, checked for accuracy and then taken directly to the job on the machine. However, this procedure does not hold good in surface roughness control; there are no such instruments as micrometers that can be set to the desired roughness, and then given to the operator to take to his bench.

Obviously, Profilometers, Brush Analyzers, or other such complicated instruments cannot be set up all over the plant. It would be just as imprac-

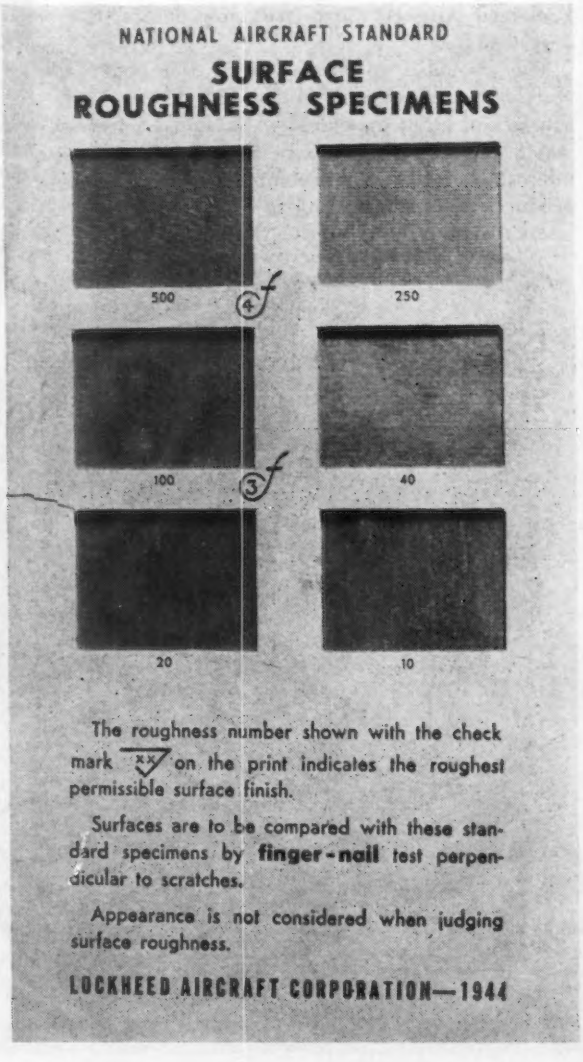
RIGHT

FIG. 21—Aluminum alloy samples of surface roughness specimens, mounted in a cardboard holder; a development of Lockheed Aircraft Corp.

o o o

BELOW

FIG. 20—Replica surfaces of electroformed iron plate developed by United States Rubber Co.


NATIONAL AIRCRAFT STANDARD
SURFACE
ROUGHNESS SPECIMENS
500
250
100
40
20
10
The roughness number shown with the check mark on the print indicates the roughest permissible surface finish.
Surfaces are to be compared with these standard specimens by finger-nail test perpendicular to scratches.
Appearance is not considered when judging surface roughness.
LOCKHEED AIRCRAFT CORPORATION—1944

ticable, because of their cost, to place a set of machined roughness standard specimens at the machine of each operator, in each inspection crib and at the desk of each tool designer and each engineer concerned with surface roughness control.

Surf-Chek

As a practical method of rapid surface comparison, North American Aviation has developed the Surf-Chek Roughness Standards shown in Fig. 22. This is a simple surface roughness comparison gage made of hard phenol-formaldehyde plastic, in a convenient size. Twenty surfaces of varying degrees of roughness conforming to the standard values designated by the National Aircraft Standards Committee are molded into the 5 x 7 in. plastic plate, through the use of precise die inserts. The rougher surfaces were obtained through interpolation of taper sections, and the finer surfaces through tracer point comparison with taper sectioned masters of known roughness. For all practical purposes of roughness comparison, the surfaces are sufficiently accurate to be considered standard.

Each individual surface is clearly marked for immediate reference, and the whole is resistant to both corrosion and abrasion. The gage is produced at such low cost that it can be made available to all personnel in any way concerned with surface roughness control.

With the Surf-Chek standards, it is possible for the operator to determine within very close limits the actual RMS microinch roughness of a part. Comparison is made by merely scraping a fingernail over the gage surface which agrees in roughness and type with the drawing specification, and then scraping the surface of the part. The difference in roughness will be immediately apparent, except for borderline cases within the critical range, where the use of tracer point instruments becomes necessary.

It is important to remember that surface roughness, even between like materials, cannot be determined visually; comparison must be made tactually with a know standard. In this regard, the Surf-Chek standards possess a further advantage; made of black plastic, the surfaces do not present a metallic surface as do the other roughness specimens. Consequently, in using the Surf-Chek standards, there is less possibility of being misled by surface color, brilliance, or hue, when making a roughness comparison.

Where inside diameters or recesses are too small to admit the finger, roughness comparison may be made with a wire held lightly between the fingers, or between the teeth. In the case of fine finishes, the operator must be careful to avoid scratching the surface of the gage or the part being compared. A 4-in. piece of No. 18 copper bellwire, cut cleanly with diagonals and bent with a right angle hook will prove quite satisfactory.

o o o

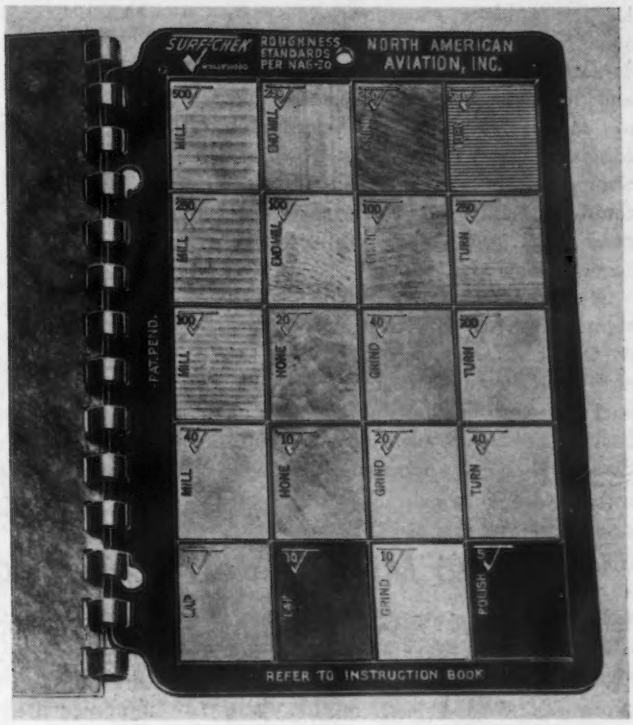


FIG. 22—Surf-Chek surface standards developed by North American Aviation.

o o o

On extremely fine surfaces, those less than 5 micro-in. a satisfactory surface roughness comparison can be made with a ping-pong ball. The procedure is to hold the ball lightly in the fingers so as to feel the vibrations as the ball is scraped across the surface. A variation of this method is to listen to the sound through a stethoscope as the ping-pong ball is lightly rubbed across the surface of the comparator and the part. The extremely fine surfaces, beyond the range of the present Surf-Chek standards, can best be measured by tracer point analyzers. In these cases, control pieces are made for comparison at the machine.

Roughness Inspection

Production control and floor inspection usually involves all three methods of comparison; some visual inspection, comparison by feel for all normal conditions and instrument comparison where very close control is necessary.

When a job has been set up, the first few pieces are normally compared by instrument with standard surface finish specimens conforming to the finish that has been specified. On the basis of this initial close control, cutting speed, feed and other factors which affect the quality of finish are accordingly adjusted. Then, all further production is controlled by feel comparison (in most cases) and the operator finds it a simple matter to detect deviations and differences.

Fingernail comparison will readily indicate whether the work is smoother or rougher than the control piece for nearly all inspection purposes. Marginal cases can be compared by instruments, and in those cases where ranges such as 40-60 micro-in. are specified, fingernail comparison with specimen surfaces approximating those limits should usually be satisfactory. When close tolerances are called for, instrument comparison may be necessary.

From an inspection standpoint, the preferred NAS-30 roughness numbers may be divided into two groups:

The non-critical range: 500 and 250 microinch. These surfaces are specified only when it is necessary to remove metal in order to size a part quickly, and where the surface finish is unimportant.

The critical range: 100, 40, 20, 10, and 5 microinch. These surfaces are made smoother than normal machining operations would produce. Finish compliance for these surfaces is very important. Any surface with a roughness of 20 or less is quite sensitive to imperfections and should be perfectly free from tool marks, scores, scratches or any other type of flaw in order to function properly.

There are many other methods of

making surface roughness comparisons besides those which have been discussed above. Friction tests, light and air leakage comparisons, the use of optical comparators, microscope comparisons, light and dark field photomicrography—these are a few that could be mentioned. However, a discussion of these does not fall into the scope of this article.

What can be accomplished by a sound program of designation, measurement and comparison? Here, it has been shown how, in engineering, surfaces can be designated upon a basis of actual physical measurements rather than approximate opinions, and how specific surfaces can be properly designated to call for special care and techniques. It has been shown how, in manufacturing, a surface of given roughness can be produced and accurately duplicated through a method of specifying roughness rather than a calling out of manufacturing processes, and by a workable means of checking roughness limitations through easy available comparison standards. It has been shown how in inspection procedures improved methods of measurement and the wide distribution of accurate replicas will permit an understanding of the meaning of a degree of roughness specified, and how personnel all along the line can immediately check conformance with requirements.

The adoption of the new nomenclature and the multiple replicas is an essential to further mastery of the problems of surface quality control. It is not the aim to arbitrarily establish these standards for all time; the way must be left open for the acceptance of advanced methods and techniques which will assuredly be a product of future progress. However, immediate problems call for solution, and it is felt that the nomenclature discussed, along with the use of the Surf-Chek standards, provide an answer for immediate action.

Two Million Volt X-ray Tube for Thick Steel Sections

HEAVY steel objects up to 1 ft. in thickness can be radiographed with relatively short exposures with the 2 million volt X-ray tube developed by the Machlett Laboratories, Inc., Springdale, Conn. With million volt tubes heretofore unavailable it was not practicable to radiograph 1 ft. sections because of the length of exposure time involved.

To obtain radiographs of thick sections having acceptable definition, the focal spot size must be very small so that the X-rays will be emanating practically from a point source. By means of a very high constant potential it is possible to obtain and maintain extremely fine focusing. Further, this voltage provides optimum conditions for heat dissipation at the focal spot, which is only a few thousandths of an inch in diameter.

The 2 million volt electron beam required not only an improved type of electron source, but, of greater importance, an electron accelerating means. The constant accelerating field over the entire cathode to target distance is provided by 180 accelerating sections which give uniform accelerating steps of 12,000 volts each. The tube operates in conjunction with an electrostatic generator which produces the 2 million volt potential.

The high voltage generator in which the tube is used employs air at high pressures as an insulating medium. The tube is of such mechanical design to withstand external air pressure of from 200 to 400 lb. per sq. in. Sealing the tube off makes it practical for use outside a laboratory. Constancy of characteristics throughout its life, as contrasted wih continuously pumped tubes, is thus assured.

The physical problems involved in the design of such a vacuum tight column, having the necessary insulating characteristics and able to withstand the high pressures involved were of unprecedented magnitude. They appeared to involve almost insuperable difficulties when considered in the light of the tube construction art as it then existed.

TWO million volt X-ray tube shown with R. R. Machlett of Machlett Laboratories, Inc., who is responsible for a major share of its development. This tube was developed for use by the high voltage laboratory at Massachusetts Institute of Technology.

In order to appreciate the nature of the problem this presented, it should be pointed out that in the average X-ray tube, the total length of the glass to metal seals involved is in the order of 2 to 3 in., whereas a column section of the type required for this purpose involved a total length of glass to metal seal, approximately 300 ft. in length, or more than one thousand times longer than exists even in the larger standard X-ray tubes. In the manufacture of commercial X-ray tubes, even under the most carefully controlled conditions, it is considered remarkable if the rejections due to leaks in metal to glass seals are as low as ten out of every thousand tubes. In contrast to this, one leak of even the smallest size in the projected column section would make it unusable—and particularly so, for "sealed-off" purposes. This comparison is further accentuated by the fact that the column is required to be operated in pressures in excess of 200 lb. per sq. in., and the rate of the leak is an exponential function of the pressure.

It became obvious in the early stages of this work that it would not be possible to utilize the usual gas flame technique for sealing metal to glass for an operation as critical as this. This led to the ultimate development of a novel glass to metal sealing procedure, involving a combination of gas flame and high frequency induction heating, which is now being successfully used for this purpose. This new sealing technique, in combination with specially developed means for detecting and eliminating glass strains of small magnitude and Kovar rings of special configuration assure complete and homogeneous bonding of metal and glass.

Tank Production In the Soviet East

By ANDREW J. STEIGER

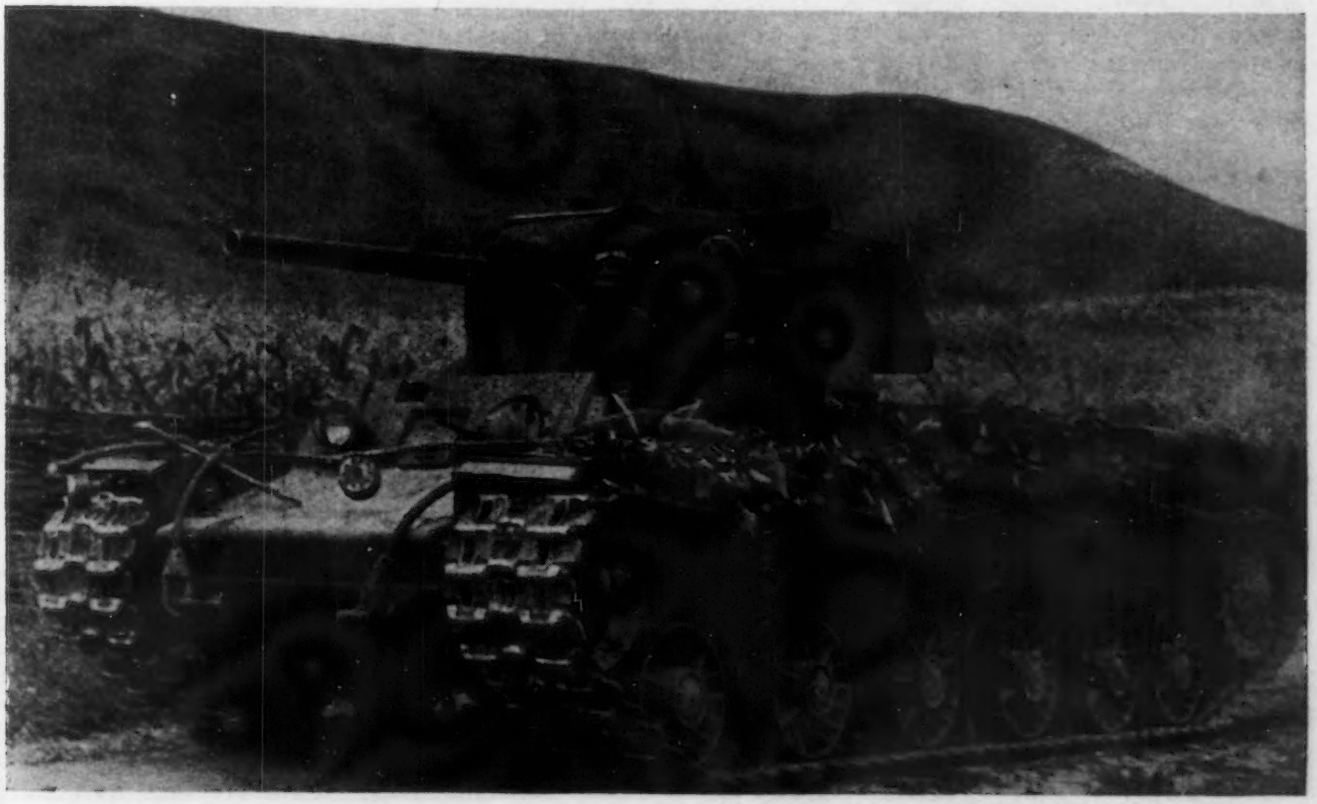
. . . In spite of the loss of its major industrial centers during the first year and a half of the war, the USSR has been able to maintain a large portion of its war output. By dismantling threatened plants and transferring them to safer regions behind the Urals, the Russians have been able to continue production of, among other things, the KV tank and to design and build the medium T-34. How the task of relocating and rebuilding its industry was accomplished is herein described.

THE tank industry of the Soviet Union developed parallel with its tractor industry and followed somewhat American prototypes. The first Soviet tractor, modeled after the Fordson, was produced at Leningrad in 1925. The first Soviet tank, also produced at Leningrad, was driven by a gasoline motor modeled after the Liberty engine. Later tanks were engined with diesel motors produced in a new plant built at Kharkov in the early 1930's. A section of the Stalingrad plant producing caterpillar tractors was also vital to tank output. The tracks of Soviet tanks were first patterned after the Christie design, a removable gear.

Thus arose the Russian tank industry during the decade prior to the war. In 1940 when the Soviet-German non-aggression pact was still in force, the Leningrad plant was awarded the Order of the Red Banner for mastering the output of heavy tanks. This mammoth tank was named the KV after Marshal Klimenti Voroshilov, then Commissar for Defense of the USSR. Later the Germans complained that the Soviets had paraded obsolete tanks through Red Square, and let them see this new 70-ton KV, powered with a 500 hp. diesel engine only when Moscow struck back in the winter of 1941.

During the war the Russian tank industry has passed through three stages: Conversion to war output, transfer of tank-making equipment many hundreds of miles to new sites

This 70-ton KV tank, powered with a 500 hp. diesel engine was first used against the Nazis in the winter of 1941.



and re-tooling for production of a new model tank, the medium T-34. To accomplish all this in less than 18 months required prodigious coordinated effort, that was not without elements of improvisation. It is true that machine tools in many plants near the western frontiers were not imbedded in concrete but were bolted down and easily dismantled for shipment. It is also true that in October, 1940, powers were given to the industrial commissariats, "if need arises," to transfer workers and technicians from one enterprise to another "wherever situated."

But it is by no means certain how much space the Soviets expected they would have to trade for the time necessary to recoup lost industrial potential. They were finally able to call a halt to the Red Army retreat at Stalingrad, after having surrendered to the Germans more than half a million square miles, an area as large as Germany and France combined. The industrial loss suffered in the Ukraine, the Don and Caucasus had to be compensated for by the increased output of eastern mills, which had been planned and built during the preceding 15 years precisely to meet such a contingency. After 1941 Russian heavy industry ceased to exist in most of European Russia. The Urals, Siberia and Central Asia bore the brunt of the battle of production.

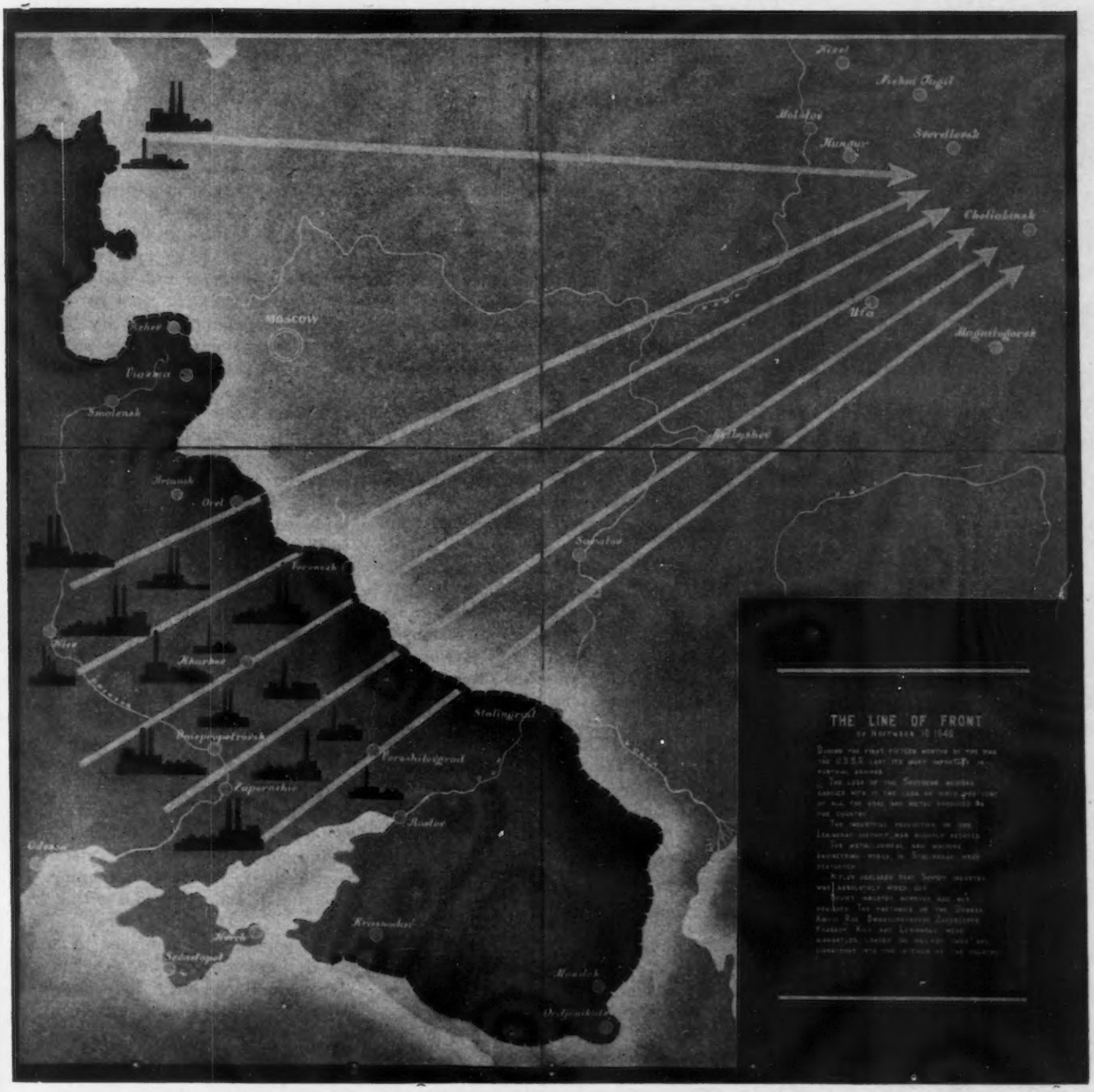
In the summer of 1941 a Ural plant, which had been used for locomotive repair work, was ordered by the State Defense Committee to convert for the production of KV tanks. Already the Germans were driving on Leningrad and hammering at the gates of Kharkov. The wrecked towns in the wake of the advancing Wehrmacht were hardly more chaotic than the Ural plant during the first few weeks after the conversion order was received. Workmen systematically disrupted orderly assembly lines, consigning highly specialized machine tools to an immense scrap heap. Bull-dozers plowed the earth, excavating new foundations. Acres of scaffolding arose as builders erected new shop space. In late August the German siege arc closed around Leningrad. In October Kharkov fell to German occupation, but the Kharkov Diesel Engine Works had disappeared. It had been moved to the Urals with other evacuated equipment and installed direct from railway cars into an immense newly built 30-acre plant. In November, production of diesel engines was resumed at the new site. From the conveyor at the Ural plant, converted in four months, rolled heavy tanks used to assist in driving the Germans from the gates of Moscow in the winter of 1941.

If the transfer of the Kharkov plant was neatly arranged, the removal of the Leningrad plant proved more difficult under siege conditions. In Leningrad the original KV tank works was twice removed within the city. To get out of range of German railway siege guns, the machinery was first transferred by night from one end of Leningrad to the other. Then, when bombing and lack of materials made operation impossible, the machinery was crated and removed to barges on Lake Ladoga, the only escape route open. Here the original KV works spent the winter of 1941-42 frozen fast in the lake ice. Only in the spring of 1942 could it be shipped across the lake to be dispatched east by rail, adding its mass of machine tools to those already operating in the Urals. The eastern tank plant was designated in press dispatches as Gorod N. (City of N.), a genuine sector of the production front. The new machinery from Leningrad had hardly been installed, when in September, 1942, carloads of vital tank-making equipment began arriving from flaming Stalingrad on which the Germans were then dropping thousand-plane bomb loads. The builders of shop space were swamped, unable to keep up with the influx of machines. Unwilling to cease production, workmen set up machine tools in the open air.

In addition to installing evacuated equipment shipped east from Leningrad and Stalingrad in 1942, the Urals plant at Gorod N. had to be retooled for the production of the T-34, without halting output of the KV tank. Designers of the T-34 worked right at the rising new plant in direct contact with the technicians charged with producing the 6000 patterns, dies and jigs necessary for retooling. Within 55 days the new tools were ready and on Aug. 22, 1942, the first T-34 tank rolled off the assembly line. The local workers named it after Stalin. The next five tanks to follow were successively christened Molotov, Kirov, Suvorov, Kutuzov and Alexander Nevsky.

Experience gained during the first year of land war against the Germans was duly reflected in the new design, a tank with low-slung turret for movement unobserved through the central Russian woodlands, with broad-flanged tracks for navigating

Russian self-propelled guns move up to the front. This weapon mounts a 128 mm. cannon on a medium tank chassis.



DURING the first 15 months of the war, the USSR lost its most important industrial regions. The loss of the Southern areas carried with it the loss of 60 per cent of all the coal and metal produced in the country. Industrial production in the Leningrad district was sharply reduced and in Stalingrad the metallurgical and machine engineering works were destroyed. Soviet industry, however, was not wiped out. The factories of the Donbas, Krivoi Rog, Dniepropetrovsk, Zaporozhe, Kharkov, Kiev and Leningrad were dismantled, loaded on railway cars and dispatched into the interior of the country.

easily in East European marshland, and with high speed for swift drives across the open steppes of the Don and the Ukraine. First employed with success at Stalingrad, the T-34 series has remained basic for the Russian medium tanks, although additional modifications have been made during the past two years. In March, 1944, it was reported that a new track tested in operations through snow, mud and cobblestones had been produced, with an effective range of about 2000 miles compared to the earlier 625 miles.

Having passed through the crucible of conversion, transfer and retooling, Russia's tank industry has re-emerged in a vast industrial combine called Tankograd, which is located in the Ural highlands farther removed from the present eastern front than the B-29 superfortress plants in Kansas are from the Atlantic Ocean. Tankograd is the Soviet tank industry transplanted from European to Asiatic Russia. Here everything from the last cog wheel to the cannon armament is made at a thoroughly self-contained enterprise, larger than the Krupp works in Germany.

The foundry is described as the "largest in Europe," having about two miles of belt conveyors for moving the endless flow of castings. It is air-conditioned and has an extensive underground waste disposal system for removing all refuse to the outside of the plant. Ladles of molten metal are transported by electric shopmobiles. Sand-guns, said to increase productivity 50 times over, are used in preparing molds.

The total castings produced here in 1942-43 would have loaded 1500 standard freight trains, cars enough to have formed an almost unbroken string from Leningrad to the eastern

plant. The non-ferrous metal or brass foundry formerly at Kharkov occupies just a small section of the entire foundry, where considerable work has been done in casting oil filters, water pumps and other engine parts from pig iron, thus economizing on aluminum and brass. Most difficult was mastery of the production of thin-walled iron castings. Effort is also directed to making gun barrels of drawn rather than cast metal. Of the 90 grades of steel used in producing Russian tanks, only 40 were made in the Urals before the war. Eastern mills have during the war mastered the output of 50 new kinds of ferro-alloys formerly produced in the Ukraine. Of the 92 known chemical elements listed in the periodic system, 46 are used in tank building. The Ural-made tanks today are produced 95 per cent from Ural raw materials. All incoming metal is laboratory-tested before being released to the forge and machine shops.

The forge shops are disposed in an area three times larger than that of the original KV plant in Leningrad, and are equipped with the latest big forging tools. Various forgings are produced here by machines ranging from manual-operated hammers of 0.8 ton to high-pressure machines like the 2500-ton McKee press. Tankograd's forge shops were erected during the war and among the many obstacles surmounted was the building of a 1500-ton reinforced concrete foundation for the powerful press used to forge diesel engine crankshafts. The foundation had to be sunk 40 ft. without disturbing columns supporting an overhead electric traveling crane. The job was accomplished by an adaptation of the cofferdam principle used in erecting bridge piers under water, and the foundation was completed in time to receive the heavy-duty forge hammers transferred from Kharkov. Heavy details like crankshafts are said to be forged clean, leaving a minimum of excess metal to be finished off by machine tools. A special pyrometer control system is used to regulate the precision heating in the forge shop furnaces.

The machine tool shops are likewise marked by the application of complicated mass production machines, to perform the 20,000 metal-cutting operations necessary in making tanks. One section alone extends a half mile in length and its extensive buildings house milling, planing, turning and drilling machines both of Soviet and American manufacture. Multiple drill-presses of 12, 24, 48 and even 108 spindles are operated by push-button. Automatic screw machines turn out nuts at the rate of 30 to 40 a min. Milling machines are set up to finish two or three surfaces simultaneously. Cold stamps and punch presses range from small five-tonners to mammoth 1500-ton machines, big as a two-story house. Such giants are set in motion by hydraulic mechanisms. Precision work on instruments with drills thin as a human hair is carried out alongside massive stamping operations which deliver tank body parts ready for assembly. Optical measuring devices are used to check the exactness of finished parts.

The machine tools are arranged along some 150 flow lines through which the stream of details passes to assembly points. The medium T-34 tank is put together by the conveyor method, building up to the finished machine as it passes down the line of fitters. The heavy KV tank is assembled by means of cranes which lift and move the tank from station to station where assemblers add essential parts until the whole is completed. Great stress is laid by Russian engineers on maintenance of the most efficient flow of parts from castings through all machining stages to the final assembly and testing. When bottlenecks develop or new devices are introduced speeding up or slowing down certain vital operations, appropriate changes are made at once to keep the entire vast producing mechanism running smoothly.

When the plant was retooled to produce the T-34 tank, it was decided to go in for high-productivity machinery requiring a minimum of skilled labor. This meant equipping machines with highly complicated rigging, which rendered much machine work automatic. Rationalization proposals introduced have cut the actual machine work by 350 machine tool hours. About 1000 machine tools were rearranged within the shops to improve the flow of details. A certain tank part, which had previously required 2228 min. on 40 different machine tools operated by 70 skilled workers, is now being made in 750 min. on 19 machine tools operated by 26 semi-skilled workers. This is a typical instance of the present trend to increase output with less workers.

Another time and labor saving method developed has been the application of high-frequency electrical treatment to surface hardening of tank metal. Induction coils with a frequency of 10,000 to several million cycles per sec. are employed to do all metal hardening. The problem of using high-frequency induction for surface hardening was solved when

(CONTINUED ON PAGE 136)

GERMAN "Ferdinand" tanks seized in action.

SHOT PEENING

And the Fatigue of Metals

. . . The man whose name is most closely associated with the fatigue testing of metals analyzes what shot peening can accomplish in lengthening fatigue life of metal components. After reviewing the limitations of the process in offsetting various forms of structural damage, Professor Moore explains the theory of shot peening and then proceeds to interpret test data based on studies conducted in his laboratory under the auspices of the American Foundry Equipment Co., through whose courtesy these data are printed.

By H. F. MOORE, M.E., D. Sc.
Research Professor of Engineering Materials, Emeritus, University of Illinois; now on Research Staff of American Foundry Equipment Co.

o o o

SHOT peening is a term used to denote the process of subjecting the surface of a metal machine part or structural member to a rain of metallic shot driven against the surface by the momentum of the shot as it is released from the rotating blades of a wheel, or by an air blast: [The term "shot blasting," sometimes used to denote this process, is more commonly used as denoting a surface *cleaning* process than as denoting a surface strengthening process.]

As the shot strikes the surface of the part, it produces a shallow layer of metal whose structure, which is made up of crystalline grains, is distorted as shown in Fig. 1. This shallow layer of metal is made harder, stronger and less ductile than it was in the pre-peened state, and somewhat harder, stronger and less ductile than the metal farther below the surface, although the metal just below the shot-peened layer is somewhat affected by the shot peening.

Before taking up the discussion of how shot peening strengthens (or, if unskillfully done, may weaken) a metal under repeated stress, five types of structural damage which may be done to structural and machine parts will be noted and briefly described:

(1) *Excessive Elastic Deformation.* As an example, a clutch plate spring may be made too light, so that even when the plate spring is flattened, the clutch will not transmit the required power. Shot peening would not be of service in such a case; it would change only slightly the elastic stiffness (modulus of elasticity) of the metal in the spring, and would not stiffen the spring so long as it was stressed within the elastic range of the original metal.

(2) *Elastic Buckling,* such as may occur in very long posts or columns. This is another case of initial failure which takes place within the elastic range of the metal. A long slender column when compressed lengthwise will begin to buckle before the metal is stressed beyond its elastic range. Here, too, shot peening will be of very little aid because the critical load which will start elastic buckling will depend, not on strength, but on stiffness of the metal, which will be very little changed by shot peening in the case of iron and steel.

(3) *Plastic Deformation.* Deformation of a machine part which remains set after load is removed is in itself structural damage in such parts as bolt and nut connections, which become loose when they are loaded beyond the elastic range of the metal. Shot peening increases the yield strength (resistance to plastic deformation) to a marked degree in the skin of the peened metal, and thus adds strength to resist plastic deformation in the outer layers of a structural part, just where the applied bending stresses are greatest and help is most needed. However, this increase of yield strength may be partly or wholly lost if the peened metal is subjected to subsequent stresses up to or beyond the yield strength of the peened metal.

(4) *Creep.* Creep is the continuing distortion of a material under a steady load. Very little is known about the effect of shot peening on creep.

(5) *Fracture.* Fracture takes place under tensile or shearing stress. While plastic deformation and creep are phenomena involving appreciable volumes of metal before appreciable structure damage is done, fracture may start at some point of localized stress concentration, such as a sharp shoulder on a shaft, and from that nucleus a crack may spread in the case of a brittle metal, even under steady load. For ductile metals appreciable yielding takes place under a steady load, and this yielding "evens up" the stress distribution, with localized plastic deformation rather than fracture.

However, under many cycles of repeated stress, especially cycles of reversed stress, a crack may start in the minute area of plastically deformed metal. This crack is due to the exhaustion of the ductility of the over-stressed metal, and once started, the crack will spread, even under a relatively low stress, causing final fracture without appreciable elongation or shortening of the piece fractured. This process of fracture of metals under repeated stress has been given the rather inappropriate name of "fatigue of metals."

Such a fatigue usually starts under shearing stress within one or more of the crystalline grains which

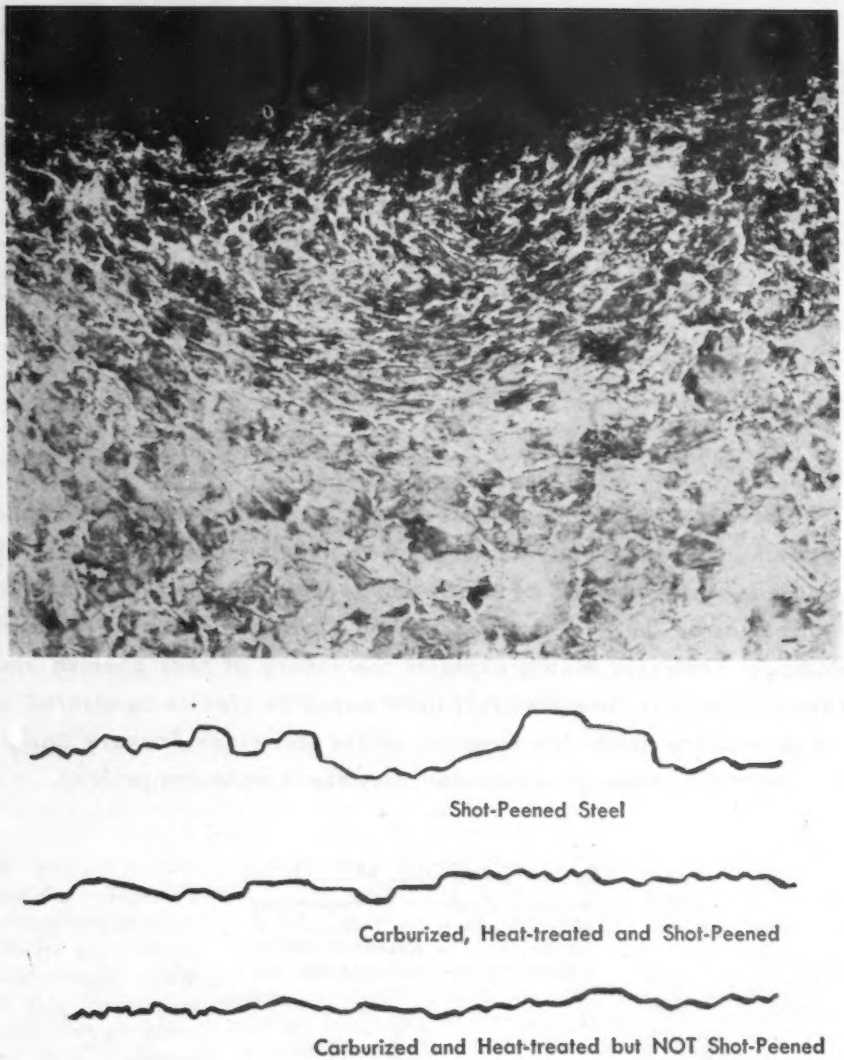


FIG. 1—Micrograph and surface outlines of shot peened and unpeened SAE 1030 steel.

make up a piece of metal. However, as the crack spreads in a region of tensile stress, it soon takes up a direction at right angles to the principal tensile stress. In a region of compressive stress the crack frequently follows a direction of maximum shearing stress, and the crack progresses much more slowly than it does in a region of tensile stress. In structural metals increase of tensile strength is accompanied by increase of shearing strength, and so any process which increases tensile strength usually increases resistance to fatigue, although not necessarily proportionately.

Shot peening increases the tensile strength of a metal just below the surface, and in addition, sets up a longitudinal compressive stress in the thin skin of shot peened metal. It probably also sets up stresses in a transverse direction and in a direction perpendicular to the surface. Now a fatigue crack nearly always starts on the tension side of a beam, hence the longitudinal residual compressive stress must be overcome by applied stress before the stress on the tension side of the beam will be a *net* tensile stress. In effect the beam is strengthened materially against fatigue failure by this layer of metal under residual compressive stress *so long as* that stress is not removed by subsequent working stresses. Hence shot peening acts in two ways to increase the fatigue strength of the metal: (a) The tensile strength of the skin is increased and (b) the effective tensile stress set up by a given load applied stress is diminished by the compressive stress set up in the skin by shot peening.

On the other hand, shot peening roughens the surface, and thus produces many shallow pits which cause localized regions of stress concentration, which tend to lower the resistance to fatigue. However, if care is taken to prevent jagged edges of peened metal, numerous fatigue tests show that the strengthening effect of shot peening properly done is, in general, greater than the weakening effect of the roughened surface, and that shot peening can be used to increase by a very considerable percentage the resistance of a metal to fracture under repeated stress.

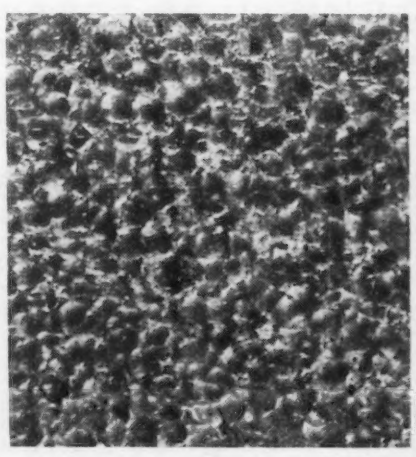
Effect of Cold Work

Shot peening "cold works" the metal at or near the surface of a piece. Cold work increases the strength of a metal, but uses up part of its ductility, and if *too intense* cold work is done on a metal the ductility may be completely exhausted and a crack started. Then the metal is not strengthened, but is weakened, especially under repeated stress.

Cold work, in various degrees of intensity, may be done by stretching, compressing, twisting, cutting, grinding, drawing through a die, rolling lengthwise, rolling circumferentially or by shot peening. Some of these processes affect a thin layer of metal near the surface which retains some residual stress after the cold working is finished—sometimes tensile residual stress and sometimes compressive. Shot peening sets up compressive stresses near the surface on the metal, and these residual compressive stresses are balanced by residual tensile stresses in the interior of the metal.

Cold work, then, affects the fatigue strength of metal in two ways: (a) it may set up a thin skin of metal which is under stress, in some cases compressive and in other cases tensile. If that stress is tensile it will be a weakening factor, if compressive it will be a strengthening factor. This residual stress is distributed across the cross-section of the piece in a

FIG. 2—Surface of shot peened SAE 1030 steel, carburized and heat treated to a Rockwell C hardness of 62. Shot peened by the American Foundry Equipment Co. with wheel type peening cabinet, new No. 19 shot used, and intensity of peening to an arc height ("h" in Fig. 6) of 0.010 in. on an Almen type C test strip. Magnification 7 times.



regular pattern, and extends through the entire length subjected to the cold working. It is a large-scale or macroscopic effect. (b) Cold work, however produced, makes changes in the shape and orientation of crystalline grains of the metal, and, unless the cold work is so violent as to cause incipient cracks, the metal is strengthened and enough ductility remains to prevent cracking. This second effect, is a small scale or microscopic effect, and it is scattered throughout the cold-worked metal and possibly extends a short distance beyond the depth of cold working. It is a summation of many localized disturbances with resulting stresses within and between crystalline grains.

At the present time there is very little knowledge concerning the relative effectiveness of macroscopic and of microscopic cold working. Shot peening, producing as it does, a thin skin of surface metal under compressive stress, is beneficial either from the viewpoint of macroscopic or of microscopic cold working effect.

How are the microscopic residual stresses set up in the skin of shot-peened metal affected by subsequent applied stresses, especially by thousands of cycles of repeated stress? Test data on this point are few, but tests at the University of Illinois

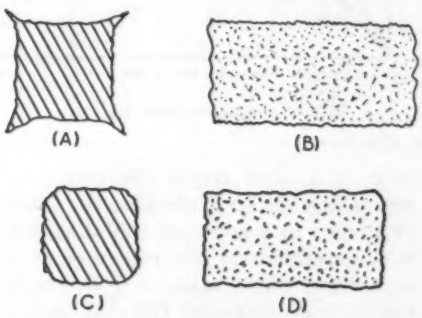


FIG. 3—Stress raising fins on shot peened steel bar. (A) cross-section of rectangular bar with sharp edges on which fins form under shot-peening; (B) side view of rectangular bar with sharp edges; (C) cross-section of rectangular bar with chamfered edges in which fins do not form, and (D) side view of rectangular bar with chamfered edges.

[Ref. 1] showed that even a single cycle of applied stress above the yield strength of the peened metal removed the greater part of the residual compressive stress. Repeated cycles of applied stress below the yield strength acted much more slowly, and no serious reduction of the residual compressive stress was found for applied stresses lower than about one third of the yield strength, even though a million cycles of stress were applied.

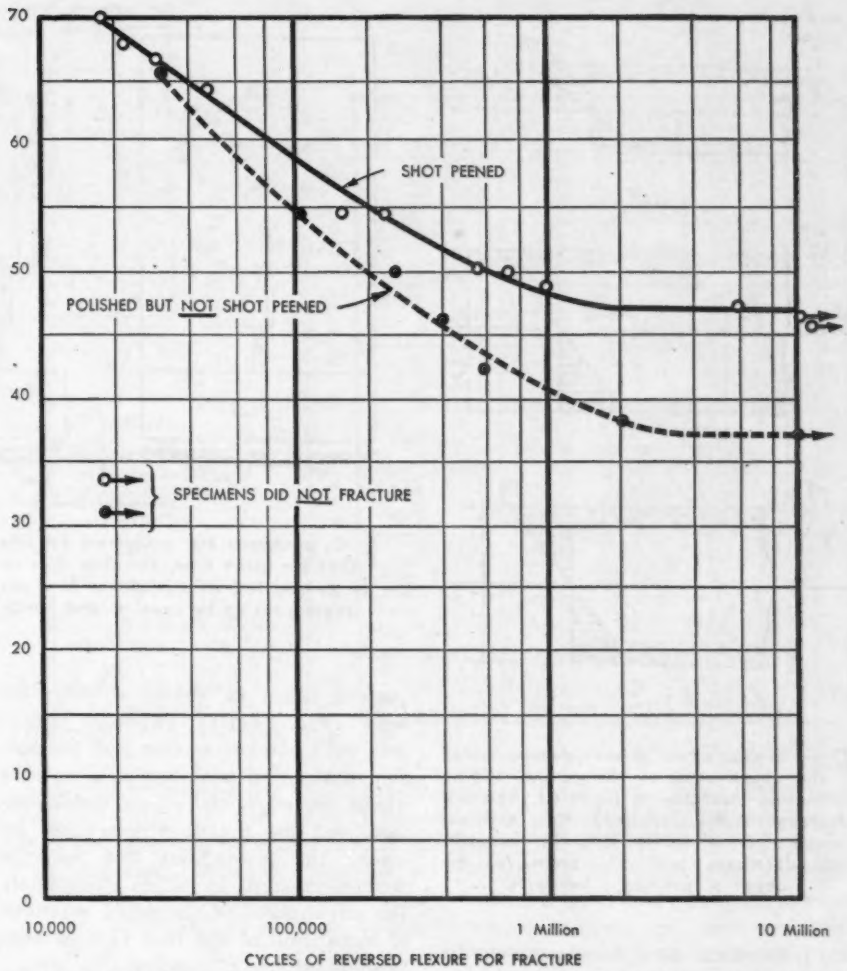


FIG. 4—S-N diagrams for SAE 1050 steel, peened and unpeened; unpeened specimens were given a shop finish.

In the case of shot peened medium-carbon steel 25 cycles of reversed bending, with an applied stress which caused 0.02 per cent permanent set of the metal, removed 76 per cent of the residual stress in the skin of the shot peened metal. Under reversed bending stresses of 62.5 per cent of the yield strength one million cycles of applied stress removed about 41 per cent of the residual stress. In the case of specimens of steel which had been carburized, heat-treated and then shot peened the application of one million cycles of reversed bending with an applied stress of 40,000 lb. per sq. in. did not appreciably reduce the residual compressive stress in the skin of the metal. Application of cycles of 50,000 lb. per sq. in. stress (reversed bending) caused fatigue fracture, but a single cycle of applied reversed stress of 125,000 lb. per sq. in. did not appreciably reduce the residue stress.

The question may be asked as to why there should be *any* reduction of residual stress by cycles or stress lower than the yield strength, or at least by cycles of stress below the "true" elastic limit. The answer to this question seems to be that the yield strength is reached at such a stress that plastic deformation has become large enough to do structural damage to the material, and that the existence of any true elastic limit for any common structural material is very doubtful.

Rough Peening Effects

Two factories tend to mitigate the damage due to the rough surface produced by peening. The first of these factors is the lowering of stress concentration at any one notch or pit by the presence of other notches or pits nearby. This has been shown by fatigue tests [Ref. 2] and by photoelastic analysis of stresses at the base of multiple notches [Ref. 3]. Many notches or pits close together seem to share the stress concentration among them, while an isolated notch has no such relief from the full stress concentration. As is shown in Fig. 2, a shot peened surface is covered with closely spaced pits, and the mitigating factor of multiple pits is present.

Secondly, the maximum stress concentration is at the *bottom* of a pit or a notch, and the action of a rain of

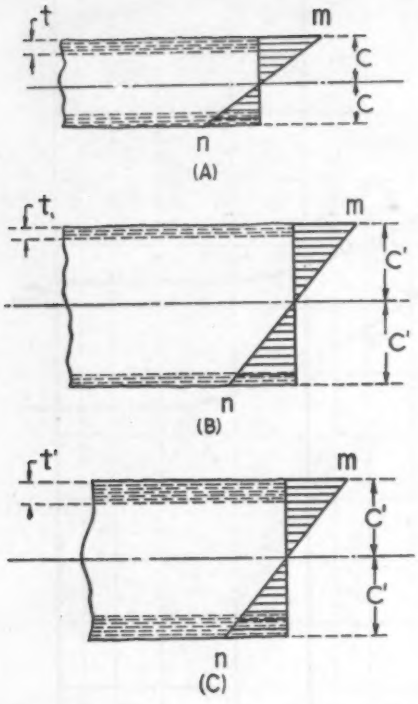


FIG. 5—Size effect in shot peened metal. The effectiveness of the peened skin in increasing resistance to repeated stress will decrease as the (applied) stress gradient (slope of the stress line *mn* with the vertical) decreases, and will increase as the depth of peening *t* increases.

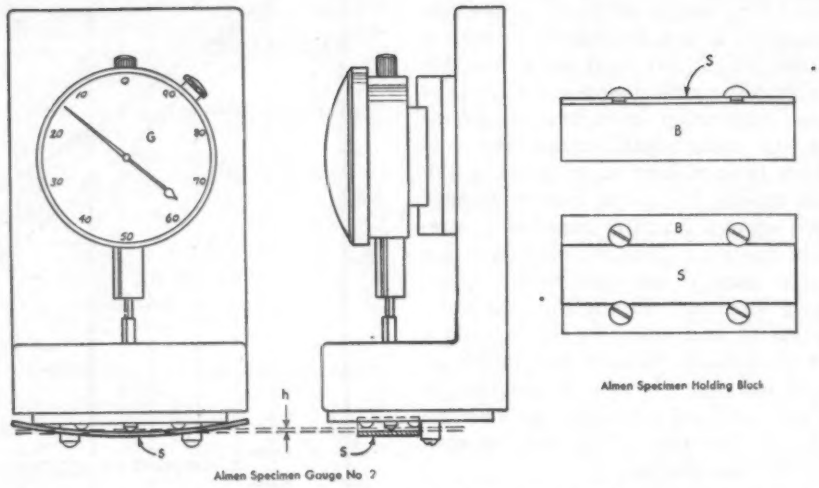


FIG. 6—Almen test equipment for intensity of peening. After exposure to rain of shot for given time, the strip *S* is removed from the base *B*. The curvature of the peened test strip (distance *h* or arc height) is taken as measure of intensity of stresses set up by peening, and hence as a measure of the intensity of peening.

hard, spherical shot insures a smooth bottom to the pits, which is a further mitigation of stress concentration.

Available fatigue test data show that in most cases the net effect of shot peening properly carried out on steel is to increase the fatigue strength in bending above that of polished unpeened specimens.

One caution is given as to stress concentration due to notches caused by shot peening. Fig. 3 (A) shows thin fins of shot peened steel pushed out at the corners of a sharp cornered rectangular bar. These fins have jagged edges as shown in the side view (Fig. 3 (B)), edges so jagged and with notches so sharp at the bottom that, even with multiple notches along the edge, the stress concentration and the tensile stresses set up under the pushed-out fins may be severe enough to offset completely the advantages of increased strength of metal and of the thin skin of surface metal under compressive stress. Fig. 3, (C) and (D) shows how these sharp fins may be avoided by chamfering the edges of a rectangular bar or plate before peening it.

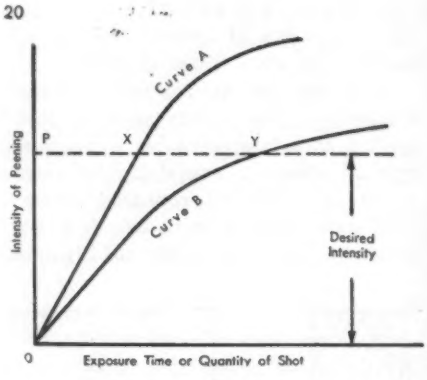


FIG. 7—Intensity-time curves.

Measuring Fatigue Strength

The fatigue strength of a metal or of a metal part is evaluated from the results of a series of tests of specimens or full-size parts subjected to a series of applied stresses of known magnitude. The variables in a series of fatigue tests are magnitude of applied stress (S) and number of cycles (N) of stress to cause fracture. In a so-called S-N diagram, it is convenient to plot the value of N to a logarithmic scale. Fig. 4 shows typical S-N diagrams for shot-peened steel and for the same steel not shot-peened. The fact that there has been

TABLE I

Comparison of Life and Strength of SAE 1050 Steel, Peened and Unpeened

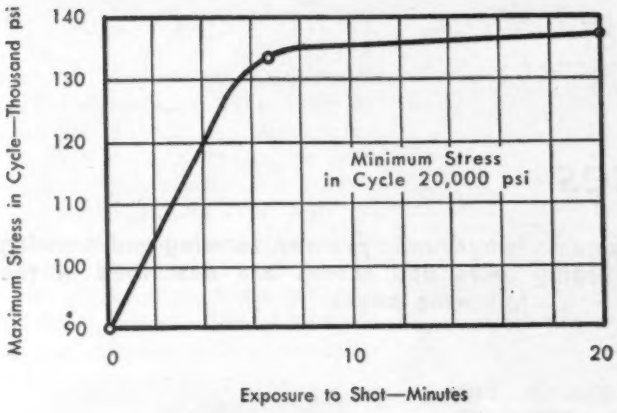
The fatigue tests were made under cycles of completely reversed bending stress

(A) Comparison Based on Length of Life for a Given Stress

Applied stress, lb. per sq. in.	60,000	55,000	50,000	45,000	45,000
Cycles of stress for fracture, peened steel	85,000	200,000	600,000	More than 10,000,000	More than 10,000,000
Cycles of stress for fracture, unpeened steel	58,000	100,000	200,000	500,000	1,200,000
Increase in length of life (number of cycles of stress for fracture) of peened steel over that of unpeened steel, per cent	46	100	200	Indefinitely large	Indefinitely large

(B) Comparison Based on Applied Stress for a given Length of Life

Cycles of reversed flexure for fracture (Length of life)	50,000	100,000	500,000	1,000,000	5,000,000	10,000,000
Applied stress for peened specimens, lb. per sq. in.	63,500	59,000	51,000	48,500	47,000	47,000
Applied stress for unpeened specimens, lb. per sq. in.	62,000	55,000	45,000	41,000	37,000	37,000
Increase of fatigue strength of peened steel over that on unpeened steel, per cent	2.3	6.9	13.0	18.8	27.0	27.0



ABOVE

FIG. 8 — Effect of exposure to shot on fatigue strength (Zimmerli).

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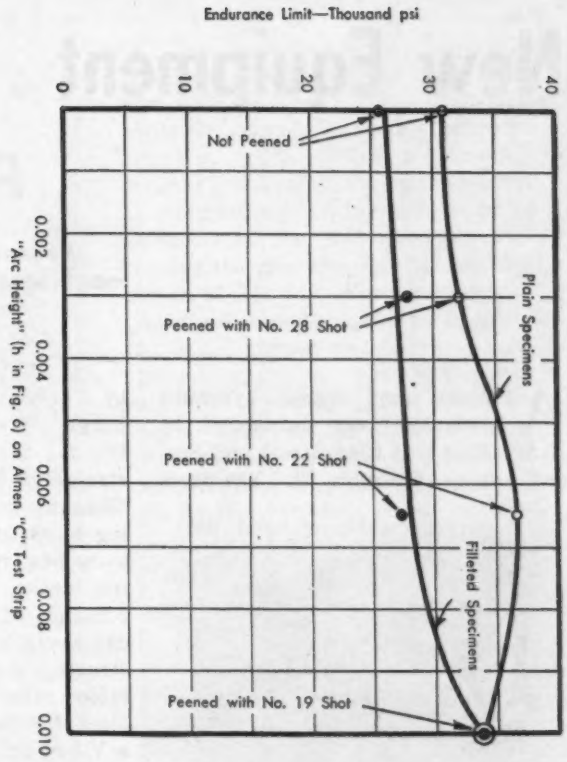
RIGHT

FIG. 9 — Effect of intensity of peening on fatigue strength. (From test data reported by Horger and Neifert).



an improvement of fatigue strength in the shot-peened steel is evident at a glance. A quantitative estimate of the percentage of improvement in fatigue strength for the shot peened steel may be made on either of two bases: (a) a comparison of the number of cycles of applied stress (length of life) of the peened and the unpeened steel for the same applied stress, or (b) a comparison of the applied stress for a given length of life. Table I (A) shows the comparison on the basis of length of life for a given applied stress, and Table I (B) shows the comparison on the basis of applied stress for a given life.

It will be noted that as the applied stress decreases the per cent gain in length of life for peened steel over that for unpeened steel increases, and that for 5,000,000 or more cycles of stress the *S-N* diagrams become very nearly horizontal so that quantitive comparison of length of life becomes impossible for all purposes.

The applied stress at which the *S-N* diagram for a metal becomes horizontal is called the endurance limit for indefinitely long life, or more commonly, simply the endurance

(CONTINUED ON PAGE 136)

TABLE II

Effect of Shot Peening on Fatigue Strength

Metal	Stress Cycle	Endurance Limit for 10,000,000 Cycles of Stress, lb. per sq. in.		Unpeened Specimens, Polished	Gain in Fatigue Strength for Peened Specimen, Per Cent	Reported by
		Not Peened	Peened			
0.85% C steel spring wire	Torsion, 20,000 lb. per sq. in. to maximum	95,000	135,000	No	42	Zimmerli (Ref. 4)
SAE 1095 steel music wire	do	90,000	135,000	No	50	do
18-8 stainless steel wire	do	65,000	110,000	No	69	do
13-2 stainless steel wire	do	80,000	120,000	No	50	do
Phosphor bronze, SAE 81 wire	do	35,000	50,000(c)	No	43	do
18-8 stainless steel	Torsion, zero to max.	46,000	92,000	No	100	Whal (Ref. 5)
NE 9470 steel, carburized	Reversed flexure	106,000	152,000	No	52	H. F. Moore (Ref. 6)
SAE 4032 steel, carburized	do	100,000	150,000	No	50	do
NE 9420 steel, carburized	do	100,000	153,000	No	53	do
SAE 1020 steel plate	do	34,000	38,000	Yes	12	do
SAE 1050 steel plate	do	37,000	47,000	Yes	27	do
SAE 1045 steel, annealed	Reversed flexure	39,500	43,800	Yes	11	Lessells and Murray (Ref. 7)
SAE 1045 steel, water quench and draw	do	80,700	75,000	Yes	—7(a)	do
SAE 9260 steel, oil quench and draw	do	108,600	106,000	Yes	—3(b)	do
Armco iron	do	26,800	27,000	Yes	1	do
SAE X4340 steel, oil quench and draw	do	66,000	78,000	Yes	18	do
SAE 1045 steel, normalized and tempered	Reversed flexure	31,000	32,000(d)	Yes	3	Horger and Neifret (Ref. 8)
	do	31,000	34,000(e)	Yes	10	do
	do	31,000	37,000(f)	Yes	19	do

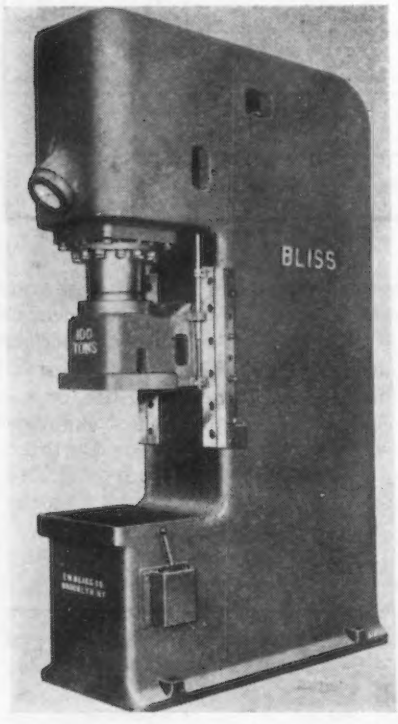
(a) Residual stresses due to heat treatment may have offset benefits of shot peening. See author's closure in reference.
(b) Peened specimens showed much longer life under stresses above the endurance limit.
(c) For phosphor bronze there may be a reduction of endurance limit under more than 10,000,000 cycles. However, there is shown a distinct increase of strength due to peening.
(d) Peened with No. 28 shot. (e) Peened with No. 19 shot. (f) Peened with No. 22 shot.

New Equipment . . .

Presses

. . . Recent developments in hydraulic presses, forming and drawing machines, hole punching units and shears are described in the following pages.

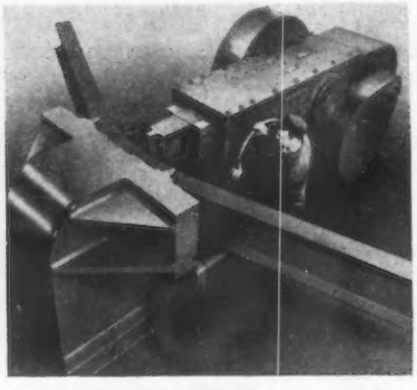
A 100-ton gap frame hydraulic press has been announced by *E. W. Bliss Co.*, 53rd Street and Second Avenue, Brooklyn 32. The press



is arranged for manual control but the electric control used on straight side single action presses is available for automatic reverse either by pressure or position. Various types of pumping units are available for different production requirements. The press, illustrated, is one of a line ranging in capacities up to 500 ton. Modification of the bed and slide can be made for special purposes. Horn type presses are also available in this series. Maximum stroke is 18 in. Closing speed is 58 in., pressing speed, 8½ in. and opening speed 54 in. per min.

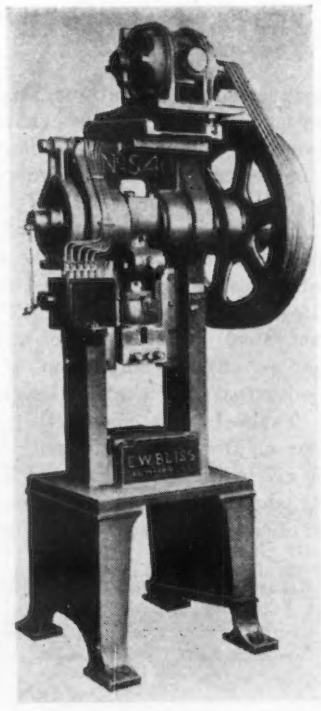
Bending and Straightening Machines

AN improved line of bending and straightening machines in six sizes having capacities ranging from 50 to 400 ton for cold bending and straightening of structural shapes and other metal forms has been announced by *Thomas Machine Mfg. Co.*, Pittsburgh. Weighing from 3800 to 55,000 lb., the machines can bend and straighten 5 to 24 in. beams. A continuously running ram with one bending block, striking against the shape to be bent midway between two bearing blocks, represents the operating principle of the machines. One man can easily handle the operation. Construction details include free running table rollers, an auxiliary spacer block for bending small sections and a V-belt drive providing quiet operation and reducing shock load on motor. The flywheel is located within the frame for safety and to eliminate overhanging loads on bearings. High pressure fittings supply lubricant to all bearings and slides.



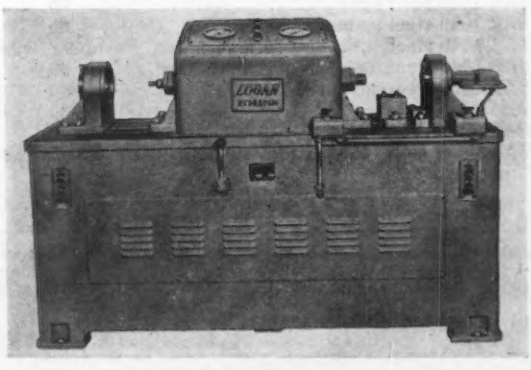
Mechanical Power Press

A MECHANICAL power press, No. S-40, designed to fill requirements peculiar to the lock manufacturing industry has been announced by *E. W. Bliss Co.*, 53rd Street and Second Avenue, Brooklyn 32. A compact solid frame for standing loads beyond the rated capacity of the press was employed with the die space and operating area concentrated for specialty dies. The press is equipped with a semi-automatic lubricating system to the essential bearings. Operating speed is about 125 stroke per min. Considerably greater production can be obtained by attaching single or double roll feeds to the press. Operation of the feed is front to back or back to front. The press is rated at 40 ton capacity at bottom stroke. Bed area, front to back times right to left is 14 x 14 in., stroke is 3 in. and die space 10 in.



Gaging and Assembly Press

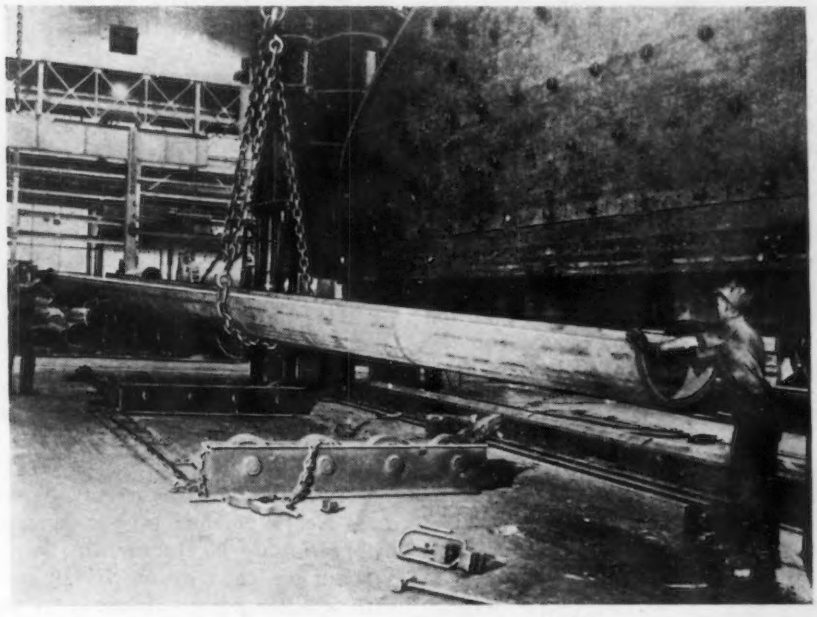
A HYDRAULIC gaging and assembly press for assembling and disassembling by predetermined press fit the elements of an aircraft engine crankshaft has been developed by



Logansport Machine Co., Logansport, Ind. Three indicating lights show the type of fit obtained. An amber light shows that the press fit is too free. A green light indicates a fit within the correct limits and a red light indicates a fit that is too tight. The red light automatically stops the pressing stroke of the hydraulic cylinder. The press has two independent hydraulic systems, each consisting of a motor driven pump mounted on an oil reservoir, an adjustable pressure control valve, an operating valve and a hydraulic cylinder. The right hand of the machine is for assembling and the left half for disassembling.

8800 Ton Press

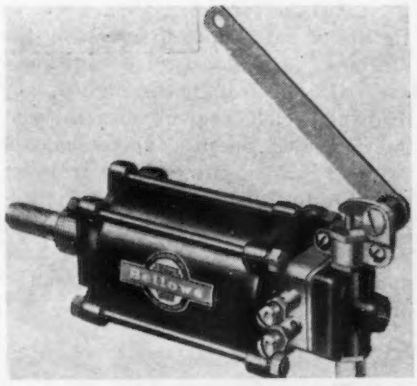
A PRESS for forming heavy plate capable of exerting a pressure of 8800 ton has been announced by the *Baldwin Locomotive Works*, South-



wark Div. The press is said to be capable of bending boiler plate up to 6 in. or more in thickness and in lengths up to 42 ft. Its overall dimensions are 60 ft. wide and 60 ft. high. It consists of two 4400 ton, four-post hydraulic presses connected by two built-up beams. The two presses operate on 2000 lb. line pressure. Its engineers claim that it produces the highest grade of workmanship yet originated and with substantial reduction in time.

Air Motor

AN air motor, the Model BM, an improved version of the Bellows-Senacon air motor has been announced by *Bellows Co.*, Akron, Ohio. The motor is a complete self-contained power unit, with integral valve, oper-



ating lever and speed controls, permitting full and positive control over all phases of its operation at all times. The valve adjusting lever is adjustable to any angle in any plane and is easily synchronized by simple linkage, cam or solenoid controls to the machine cycle for fully automatic operation. Dual exhaust throttle controls permit infinite speed regulation of the piston rod in either or both directions. The air exhaust stream can be used to eject parts from holding devices or to clean chips and dirt away from the work area. The motor operates on any air pressure up to 175 lb. per sq. in. Power thrust is approximately five times operating air line pressure. The motor is available in strokes ranging from 1½ to 48 in.

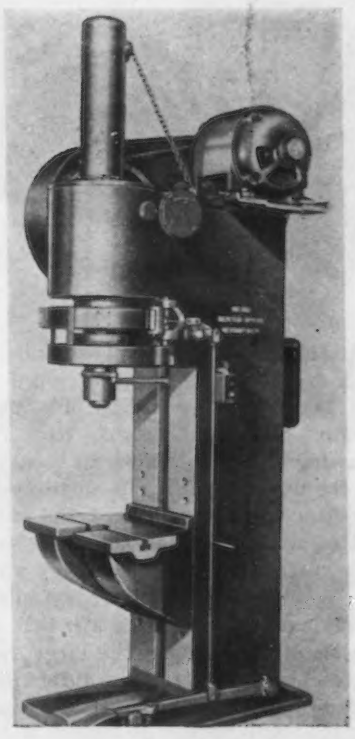
Hydro-Squeeze Gun

BUILT for pressures up to 1000 lb. per sq. in., the Hy-Mac hydro-squeeze gun, a portable 1½-ton hydraulic press with off-set platen and ram, has been announced by *Hydraulic Machinery Inc.*, 12825 Ford Road, Dearborn, Mich. O ring type seals are used on the piston. Ball-type switches control a spring returned four-way valve. When both switch buttons are pressed, the valve solenoid is energized and oil under pressure is valved into the hydro-squeeze gun moving the ram through the working stroke of 1½ in. When one or both buttons are released, the valve solenoid is deenergized and the ram starts the return stroke. The offset platen and ram will accommodate numerous special adaptors for various operations such as pressing bushings and pins, riveting, dimpling, etc. A standard Hy-Mac hydraulic power unit gen-

erates the hydraulic power for operation of the gun. Power units can be furnished with sufficient capacity for powering numerous guns from a single unit.

Power Press

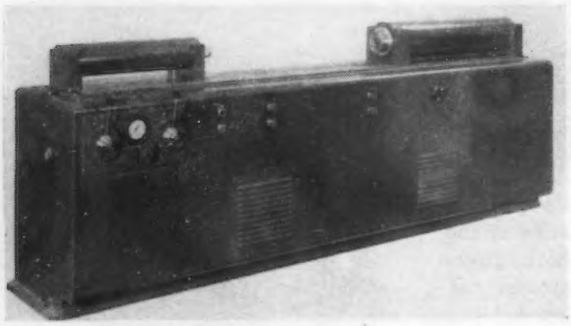
A SEMI-AUTOMATIC, power-driven, 30-ton press for all kinds of straightening and bending opera-



tions, for assembling gears and roller bearings to shafts, pressing in bushings and a wide variety of other work has been announced by *General Mfg. Co.*, Detroit 11. The press is foot operated and applied pressure is at all times under the control of the operator.

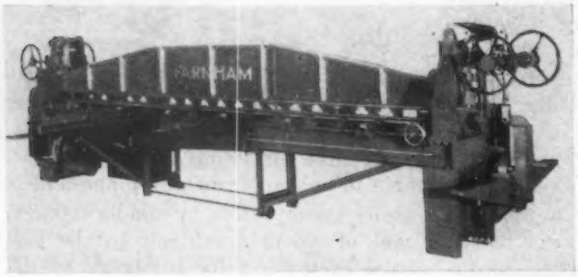
Hydraulic Press

AN air hydraulic, gap type speed-press, called the Corsair, having a maximum pressure of 1¾ ton, has been announced by *Studebaker Machine Co.*, 1221 South Ninth Street, Maywood, Ill. To operate, the hand (or foot) control is pushed down. The ram travels the set stroke from 1/32 to 2½ in. and delivers preselected pressure. The operator releases the control and the ram retracts automatically. The air cylinder and the hydraulic pump units are built into the press body.



Drawing Machine

A 7½ TON hydraulic cold drawing machine has been developed by the *John S. Barnes Corp.*, 301 South Water Street, Rockford, Ill. The drawing die is centrally mounted on the working table. A small cylinder ram traverses forward and stops behind the die. Then the large ram moves forward, forcing the work through the die. The drawn piece upon leaving the die is steadied by the small ram. Thus the large ram moves forward exerting a differential load of 5 ton upon the work. The dual push button control system requires the use of both hands in operating the machine. A dial pressure gage indicates the die loading throughout the drawing cycle. The two adjacent control handles operate speed control valves which permit variable traverse rates up to 240 in. per min. The hydraulic structures are unit mounted within one end of the machine base and the electrical control panel at the other.

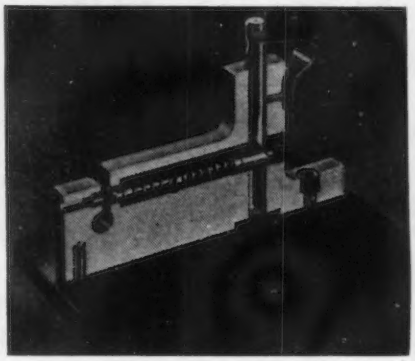


Forming Roll

A FORMING roll capable of forming leading edge skins or fuselage skins to desired contour, automatically, in one pass through the machine, has been designed by *Paragon Research, Inc.*, 2061 South Park Avenue, Buffalo 20, for *Farnham Manufacturing Co.*, Buffalo. Flat aluminum alloy sheets are fed into one side of the machine and the finished curved parts come out of the other side. The movement of the upper roll is controlled by two templates. As the part feeds through the rolls, these templates raise or lower each end of the upper roll as required. Hydraulic pressure is used to keep template followers against the templates and to raise the upper roll for inserting the sheet to be formed. Adjustable stops are provided. The model shown will form aluminum alloy sheet 1/16 in. thick, 15 ft. long, to a minimum 1¼ in. radius.

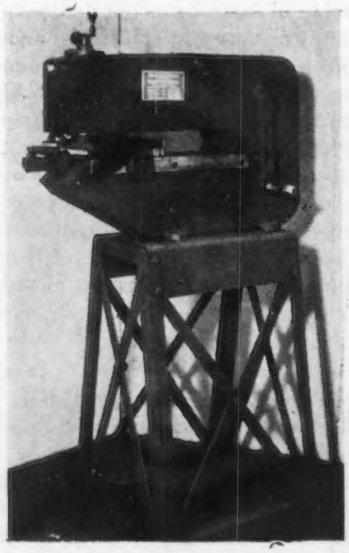
Hole Punching Units

DESIGNED for punching holes in flanges, angles, container sides and similar shaped and formed work, *Wales Strippit Corp.*, North Tonawanda, New York, has announced their Wales Horizontal Type "H" Hole Punching units. Punching holes in the sides of the work instead of on top of flat surfaces is made possible by punch moving back and forth horizontally instead of up and down. Each unit is independent and self-contained which permits the same group of units to be used and reused, placed and replaced on press brake rail and on templates in stamping presses to punch unlimited straight patterns. The minimum center to center distance is ⅞ in. Punch, die, guide, and stripper spring are held as an independent self-contained unit. The holder keeps the punch and die in perfect alinement. All that is required to make a set-up is to place the units in position according to a master pattern and to start punching at the first stroke of the press ram without any further adjustments. Press down time between production runs is said to be reduced to an absolute minimum by setting up the patterns outside the press.



Rotary Shear

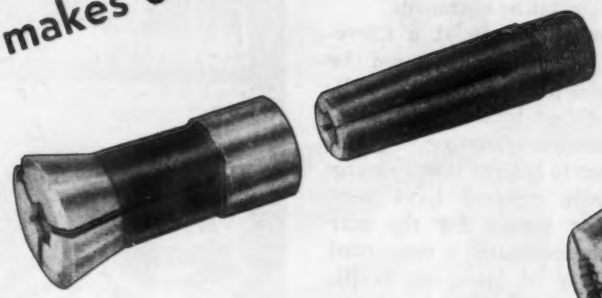
A HAND-POWERED rotary shear, No. H-06, has been announced by *Whiting Corp.*, Harvey, Ill. It has a maximum capacity of No. 16 gage with a slitting gage mounted in the throat. The hand crank is adjustable.

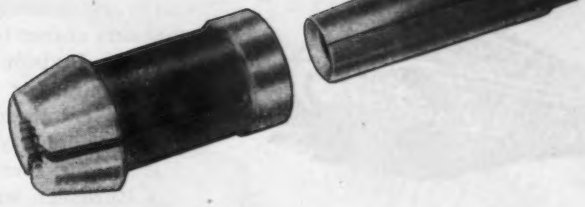


Style "B" Master Feed Fingers and Pads

HARDINGE Precision Collets and Feed Fingers for all makes of Automatics, Turret Lathes and Chucking Machines

Style "S" Sure Grip Master Collets and Pads





HARDINGE
ELMIRA, N.Y.

HARDINGE Precision Collets for all makes of Lathes and Milling Machines

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

Assembly Line . . . STANLEY H. BRAMS

• First buy on steel by General Motors plant will total 800,000 tons, covering 500,000 autos . . . Briggs is planning 25 per cent increase in its facilities for Chrysler Corp. bodies.

DETROIT—Like a print slowly coming into life in a photographer's developing bath, the outlines of postwar intentions are now increasing in strength in the auto industry. More details were filled into the General Motors picture this week, and planning of Briggs Manufacturing Co. began to emerge for the first time.

General Motors, as has been often reported, will spend $500,000,000 on its reconversion program. Now it has been revealed how much of this money will be used for initial ordering of materials. The day a go-ahead signal is given, GM will activate ordering for 800,000 tons of steel and approximately 125,000 tons of iron. If the past is any criterion, somewhat more than half of the steel buy will be in sheet and strip, with carbon bars the next largest item. Roughly two-thirds of the iron requirements will be in gray iron, on the basis of past experience, and the remainder malleable. It is interesting to deduce from this ordering that General Motors does not intend at the start to make any extensive use of aluminum, either for motor blocks or for sheet metal sections.

The company, it might be added, will also place orders on go-day for 86,000,000 lb. of rubber compound, 53,000,000 lb. of glass, 43,000,000 lb. of upholstery material, and 40,000,000 lb. of paint and thinner. These orders will cover requirements for 500,000 automobiles.

Production on this broad bill of materials will require approximately 4600 new machine tools needed for limited production. All of which have now been ordered, and some have already been delivered. For full reconversion a total of about 25,000 new machine tools must be obtained.

Recent remarks made at a Cleveland press gathering sponsored by General Motors pointed to body facilities as the tightest bottleneck in company reconversion planning. There appears reason to believe that so many Fisher Division presses have been sold, leased or loaned for the war period that the company is concerned over availability of stamping facilities in the event of a quick end to the European war and a sudden permission to start automobile production again. Inasmuch as dies in the Fisher shops are made to fit certain presses, any farming out of press work would not be of particular aid. And, in the absence of the machines, orders for replacements are coming back with rather lengthy delivery dates attached.

On the face of it, most other automobile firms might be expected to face the same problem, and just as acutely. But the fact seems to be that facilities in other plants apparently are scheduled to be cleared and made available by the time automobile output is authorized. In the case of Ford, its press facilities are not too greatly tangled up with war work. The Seaman Body Division of Nash appears likely to be available when the need arises. Hudson has some worries on availability of its body plant, but does not seem too concerned. Studebaker will continue to buy body sections from Budd Mfg. Co., and Willys-Overland, as recently noted, will obtain requirements at the start from American Central Mfg. Co., Connersville, Ind. Packard will utilize Briggs facilities when reconversion sets in.

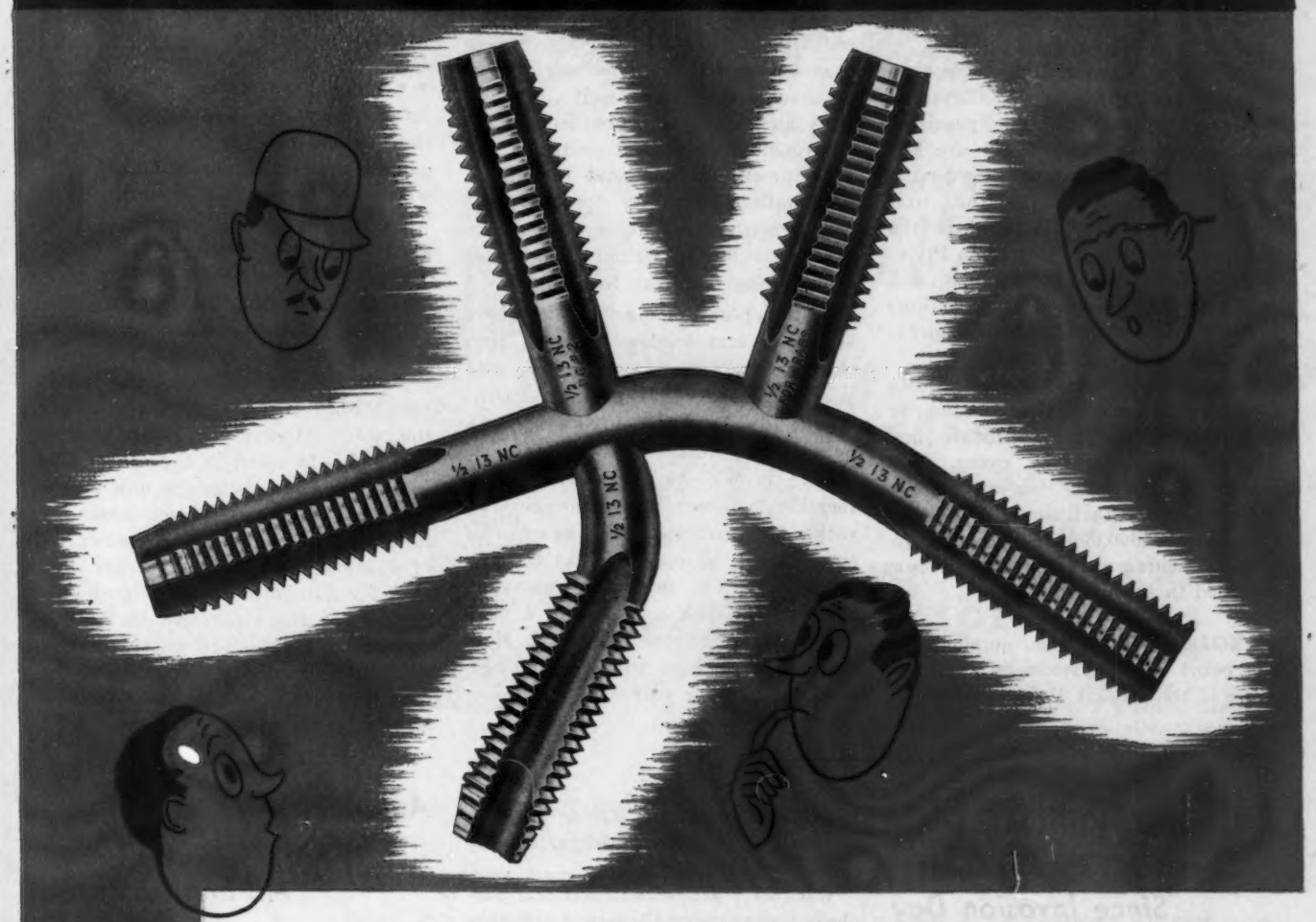
AS for Chrysler, it will depend on its own shops and on Briggs, and in neither case does difficulty seem to be pronounced, at least comparatively. The outline of Briggs planning indicates that conclusion.

Briggs is preparing to be able to fill orders from Chrysler 25 per cent larger than in prewar days. The Mack Ave. plant will be used for most of this work, and the Vernor and Eight Mile plants will also be drafted for part of it. The Meldrum plant is earmarked for assignment to the Packard work, with auxiliary aid from Vernor and Eight Mile. As soon as possible, however, the Packard job will be moved to Conner Ave., and work done at the Vernor shops will be centered at Meldrum, which will be the headquarters for small output jobs—convertibles, seven-passenger models, and specials. The North Side Vernor plant will be given over to the Jig and Fixture Div. to relieve congestion in the Vernor South Side tool room.

The Briggs, Hamtranck plant, original site of manufacturing for Briggs plumbingware, may be converted to peacetime production before any auto reconversions are allowed. Plans call

DUAL FRONT WHEELS: *Successful findings are reported by Differential Wheel Co., Detroit, in testing of a bus equipped with dual wheels on the front axle as well as the rear. More even disribution of load on the axles is made possible, resulting in savings on tire wear, even though four tires are used on the front instead of two. Most difficult problem solved in the installation was that of steering. Company officials maintain that heavy vehicle handling is actually easier with tires and pairs than single, and that the results of the test runs will bring dual wheels into use on heavy trucks as well as buses.*

An ALL-PURPOSE TAP?



..there ain't *NO SUCH THING!*

But, there *is* a tap for every purpose! Every material, almost every type of threading job, requires a particular tap or die built to do the particular job.

Don't waste time and money experimenting when you meet new thread-cutting problems. The Greenfield Tap and Die Corporation maintains a complete staff of field men and factory engineers whose accumulated experience in all phases of thread-cutting is readily available to you.

ARMY E NAVY

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GREENFIELD TAP and DIE CORPORATION • Greenfield, Massachusetts

for a likely considerable increase of facilities at this location, in line with expectation that demands for the product will be multiplied.

Outside of Detroit, Briggs plans to continue operations in its Cleveland foundry, which produces precision non-ferrous castings. Plans are less definite in the immediate reconversion period for the Evansville, Ind., unit of the company. This plant in the past has been closely geared to Plymouth assembly work in Indiana, and evidently the immediate anticipations for the Plymouth-Evansville operations are presently clouded.

Briggs has completed most of its floor layouts for normal production, so it will know where to reinstall jigs, fixtures, spray booths, ovens, conveyors, etc., needed for automobile output. These facilities will replace close to $40,000,000 in government-owned machinery and equipment now installed in the plants.

PROJECTIONS on employment point to approximate maintenance of the present 33,500 workers at Detroit through next March, after which projections are not completely drawn. Cleveland's payroll of 200 will likely increase slightly during that time, and the 4100 working at Evansville will likely swell a bit also. This steadiness is accounted for by enlargement of present contracts and development of new ones to balance cancellations such as occurred this week when the Air Forces cutback an order for 60,000 fighter plane fuel tanks being made at Briggs.

Postwar planning in a different sphere developed last week with word that the Navy will continue after the war to operate its Ordnance Plant at Centerline, on Detroit's outskirts, as a permanent ordnance shore establishment. It will be transferred when feasible to direct Navy management, rather than private hands, as at present. It will be recalled that Hudson Motor Car Co. originally managed this plant, which was shifted a year ago to Westinghouse Electric & Mfg. Co., whose contract was renewed last week for another year.

Ford Motor Completes Supercharger Contract

Detroit

• • • **The Ford Motor Co.** completed its contract for production of aviation turbosuperchargers on Oct. 31, after a production run of 52,244 units which was begun in January, 1942. This job required 3700 workers at peak, but the number had been reduced to approximately 2000.

It is understood that manufacture of these turbosuperchargers will be continued at other plants. What will replace the turbosupercharger activity at Ford is not yet known. Before the war Mercury and Ford bodies were manufactured in the area; some of the old body bucks are now stored between the supercharger assembly line area and the test cells. Indicative of company indications to use this area for automotive production in the future was the statement in the announcement that, "new conveyor lines and conveyors must be installed in the building before resumption of automobile manufacture."

Cleveland War Output Expands 13.8 Per Cent Since Invasion Day

Cleveland

• • • **Registering an overall** production increase of 13.8 per cent since D-Day, contractors of the Cleveland Ordnance district turned out more than $965,000,000 in bombs, tanks, trucks, and other war materiel during the quarter just passed.

In the regular quarterly report on district activity, it was revealed that truck production was doubled and tire and tube output stepped up by 350,000 over that of six months ago. Area shell production was increased by 200,000 and cannon went from 10,245 to 30,509.

With about a million dollars worth of tires and tubes being shipped from the district every day, indicating the need for heavier types of tires, it was noted that while unit volume has increased about 10 per cent, volume increase by weight has been about 15 per cent.

Contract terminations, cause of steadily increasing concern, have had little or no reflection on the dollar volume of Cleveland ordnance district procurement. According to Col. E. A. Lynn, district chief, 665 contracts have been terminated, but during the last quarter as many as 10 contracts a day have been awarded.

With 2579 prime contracts and purchase orders under Cleveland ordnance administration with a value of $2,491,000,000, representing a 171 million dollar gain over the contracts in existence for the period ending June 30, which in turn was 300 million dollars above the first quarter of the year, the military order situation can scarcely be classed as gloomy.

In responding to military requests from theatre of operations, contractors of Cleveland Ordnance, distributed through 55 counties in northern Ohio and three in Pennsylvania, produced among other things 1,434,400 bombs, 260,000 mines, 21,790,820 weapons including carbines, Garand rifles, machine gun mounts, and small ammunition items.

Other production figures given were: 37,569 tanks and military vehicles, 1,500,000 tires and tubes, 15,451 storage batteries, motors and band tracks and more than $7,500,000 in spare parts.

An important part in the production of the "big four" big guns, bombs, trucks, and tires, the district was asked by Col. Lynn not to permit itself to become a bottleneck at this or any other stage of the war.

American Aircraft Experts to Visit All English Plants

Washington

• • • **Technicians representing** American aircraft firms will tour Britain's aircraft manufacturing plants in the near future, hopeful of reaching agreements on standards for parts and accessories to make them uniform, according to Flt. Lieut. D. G. Moffitt of the British Air Commission. Uniform standards in the field would reduce production costs and speed conversion to war production, according to Lieut. Moffitt.

The group will spend several weeks in Britain, visiting each typical aircraft center and maintenance base.

Americans who will go include T. P. Hearne, chairman of the international standards project of the National Aircraft Standards Committee and Ryan Aeronautical Company; Eric Dudley of Curtiss-Wright Corp.; Eugene W. Norris, Aeronautical Chamber of Commerce of America; J. D. Redding, Society of Automotive Engineers; L. D. Bonham, Lockheed Aircraft Corporation; Gustav Carvelli, Wright Aeronautical Corporation, and Lieut. Col. G. R. Gaillard, of Army-Navy Aeronautical Board.

Salvaging OF STEEL GAGES
By Hard Chrome Plating

★ **MULTIPLIES THE ORIGINAL LIFE OF THE GAGE AT LEAST *FIVE TIMES***

★ **PRODUCTION DEPARTMENTS GET THE BENEFIT OF *GREATER* MANUFACTURING TOLERANCES**

A wide variety of gages—including thread plug gages—are salvaged by Lincoln Park. In addition, many types of non-cutting precision tools are adaptable to Lincoln Park's chrome plate salvaging operations.

Chrome plate salvaging is—and has been for several years past—an important and highly specialized part of Lincoln Park's operations. This service offers two important advantages to any customer.

First, the average wear-resistance of a Lincoln Park chrome plated gage is approximately five times that of a similar steel gage. Second, with any gages, wear allowance must always be taken into consideration. When wear-resistant gages are used, it is obvious that allowance for wear can be reduced considerably . . . automatically increasing the manufacturing tolerance. This slight extra percentage of tolerance becomes highly important when the dimensions of parts being inspected are very close to required limits.

Today, Lincoln Park has a new, modern chrome plating department housed in a separate building adjoining the main plant. In this department are all the facilities to put new life and greater usefulness into all of your gages and non-cutting precision tools which can be salvaged by chrome plating.

***NOW* . . . YOU CAN EXPECT PROMPT DELIVERY OF SALVAGED GAGES**

Deliveries on salvaging work are considerably improved. Our weekly "Current Delivery Schedule" provides exact information. If you are not receiving this schedule regularly we will be glad to add your name to our mailing list.

ARMY (E) NAVY

LINCOLN PARK INDUSTRIES, INC.

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Washington . . .

L. W. MOFFETT

• Bearing supply seen plentiful if demands become no greater . . . War Department holds to view of manpower shortage . . . Others see the situation easing at various points.

WASHINGTON — Unless war needs for bearings after X-Day prove greater than present expectations, WPB officials say there will be plenty despite the fact that current war programs have created shortages. The bearing industry is now producing six times more bearings than were made before the war.

Shortages are in the larger sized ball bearings ranging in diameter from 53 mm. to 170 mm. and in the larger tapered bearings more than 8 in. long. Diameters of 53 mm. to 100 mm. are the sizes required by the automobile, washing machine and refrigerator industries.

Sudden demands for particular sizes by the armed services may create temporary shortages after X-Day, the WPB Bearings Branch says. The armed services and some consumers have surpluses in bearings below 33 mm. in size.

* * *

War agency officials who think war production is adequate describe the manpower situation as easing. Some of this thinking is at WPB, but the War Department says that there is still a shortage of 200,000 men, and WMC Chairman Paul V. McNutt is taking steps to prevent shrinkage of the number of male workers in war industries.

Mr. McNutt proposes interregional clearances, reduction of employment ceilings in less important plants and concentration on the "must" programs to prevent more than the previously estimated loss of 1,000,000 workers this year.

Hartford is cited as an extreme example of shrinkage. In 52 war plants, Hartford has lost 10,000 men in the last year. Between July and August the essential companies lost more than 1800 men. In September, the decrease in employment was 800 which is the average for the 12 months.

The Connecticut city was once classified as a Group I labor area, but has recently been moved into the Group II classification. Workers have been drafted or have drifted back to the farms or to civilian pursuits.

One WPB official says that while this trend is serious in some programs, it has the tendency to reduce puffed-up supply programs by a natural means.

* * *

Detroit's controversial manpower situation is definitely easing. The Ford Motor Co. has been able to reduce its work week to 45 hr. and the Murray Body Corp. has been able to reduce its work week from 54 to 48 hr. Engineering skill which was at a premium a few months ago is now fairly plentiful. WMC reports 32 independent engineering companies who offer the services of more than 300 engineers.

Tool companies are reporting open capacity, and this is said to be general, except for bottlenecks in such types of tools as broaching machines.

* * *

One explanation of this is seen in WPB Production Executive Committee Staff reports that between $76,000,000 and $79,000,000 in contracts in Michigan were canceled by the War Department in September. Many of these terminations were in Detroit.

The Ordnance Department which at one time was placing from $300,000,000 to $400,000,000 a month in the Detroit area only placed $55,000,000 worth of contracts in September.

The Buick Motor Co. received the brunt of the cutbacks, getting termination notices for $14,340,000 in tank contracts and $22,352,000 in B-24 Liberator engines. The aircraft engine cutback was a reflection of the previous cut in the big bombers; it was a spare engine program.

The Ford Motor Co. lost contracts amounting to $7,000,000 for superchargers and more than $15,000,000 in spare B-24 engines. The Briggs Body Corp. received a termination notice in its contract for producing tank turrets; the contract was for

NEW MEDIUM:—*Successor to the long famed Douglas A-20 Bomber is the A-26 Invader, generally similar in outline, but reputedly capable of far greater speeds and equipped for several different armament assortments.*

RAISES TOOL LIFE *5 Times!*

SUNICUT

increased tool life from 75 to 380 pieces per grind

When maximum tool life on an automatic machining operation is raised from 75 pieces to 380 pieces — simply by changing the cutting oil — it's a story every production man interested in saving time, money or material wants to hear. Well, here it is!

Output was 30 to 75 pieces per tool grind, and there was a high rate of drill breakage. Time and manpower lost in changing and regrinding tools limited production . . . and to add to their troubles, finish of parts was poor.

Sun Oil Engineers heard of the problem and offered help. After studying the operating conditions, they recommended a change in cutting oils to Sunicut. The shop foreman agreed to a 3-months' trial.

Now 380 pieces per grind is their average tool life — an increase of 305 pieces! Finish is greatly improved . . . and production is up.

Sunicut . . . a clear transparent sulphurized cutting oil . . . has high heat-absorbing and metal-wetting qualities . . . making possible maximum tool life, nth degree accuracy and fine finish.

Ask a Sun Cutting Oil Engineer how Sunicut's advantages can be applied to your own shop. Write today to . . .

SUN OIL COMPANY • ***Philadelphia 3, Pa.***

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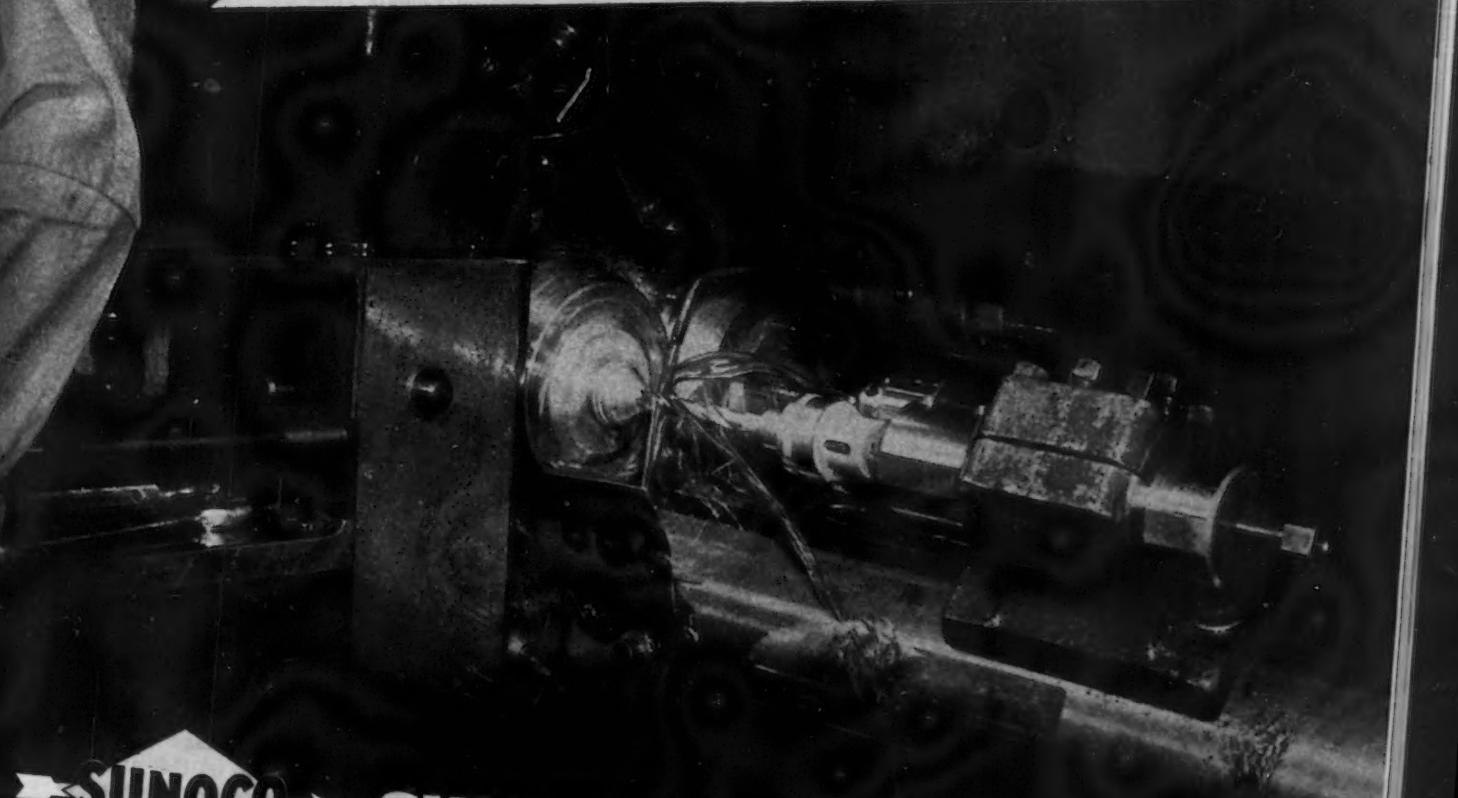

SUNOCO

SUN INDUSTRIAL PRODUCTS

HELPING INDUSTRY HELP AMERICA

$6,307,000. The Extruded Metals Co. lost out to the extent of $2,400,000 in a contract that was ended that called for alloy production.

The Hudson Motor Co. will have the bulk of its war work shifted soon to the Fisher Body plant at Cleveland. Fisher a short time ago was told to stop making the P-75 fighter. More than 2600 planes were involved in the cut.

* * *

The free traders who admit that the wiping out of international trade barriers will cause serious dislocations to thousands of areas throughout the world, killing off the industry of one country and expanding that of another, propose that artificial readjustments be made using the American dollar as the cornerstone.

Free trade would knock out tariffs, imperial preferences and old-time cartels. But it is understood that the administration wants to run cartels itself. While doing this, the assumption is that American credit and American industrial planning, products and know-how would save the world from want and war.

There are even some government officials who are toying with the international labor organization idea that there should be wage floors instituted in every country in the world.

If this is the pattern of the administration's foreign trade policy—to WPA, dole and boondoggle the world into a common pattern with American dollars, then it inescapably follows that the American standard of living will be reduced to that of the rest of the world.

Of course, it is difficult to find any but the most radical opinion which believes that Congress will go along with such philanthropic ideas. It is bet that the American people won't either.

The public can be relied upon to support a war to defend this country from aggressors. It has authorized the regimentation of the American economy and the expenditure of millions of lives and dollars to win this war. But, it is doubted that the average American's generosity extends to giving away so much of his country after the war that the United States will become an impoverished nation.

Self defense is among the first laws of nature; helping one's neighbor is fine if it doesn't lead to the poor house. Charity can go too far.

o o o

OPA Permits Export Price Adjustments

Washington

• • • **OPA has announced** that exporters may contract for future sales at prices that can be increased up to the maximum price in effect at time of delivery. This action, effective Nov. 1, is taken to facilitate the making of contracts, particularly during the reconversion period, so that manufacturers and other exporters can go ahead and build up a backlog of orders for future delivery. Under the new provision they will be assured that if higher maximum prices are allowed by OPA after export sales contracts are made but before delivery, the increased prices can be charged. This adjustable pricing provision is contained in many regulations covering domestic products.

Heretofore, exporters have had to make their sales contracts at prices no higher than the existing maximum prices and have been unable to adjust them to reflect any subsequent increases in the ceilings made by OPA before all the goods contracted for have been delivered.

This has discouraged the making of export contracts long in advance of intended delivery. Present war developments and reconversion prospects have now emphasized the necessity for a flexible price basis.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

HERE'S TH' COMPLETE BLUE PRINT OF ALL TH' RECOIL MECHANISM-- NOW RIGHT HERE IS-- LESSEE-- UM--
THAT POOR GUY! I NEVER SEEN A MAN GIT OUT OF A COAT SO QUICK! GOT CAUGHT IN THAT MACHINE-- HE MIGHTA BEEN KILLED-- HE MAY BE MAIMED FER LIFE--
LET ON YOU DIDN'T SEE IT, YOU FATHEAD! DON'T MAKE AN ENEMY-- NOBODY ELSE SAW IT! NEVER LET A MAN KNOW YOU SAW HIS STUPIDITY-- LET HIM GIT BACK INTO HIS COAT AN' LOOK LIKE NOTHIN' HAPPENED AN' HE'LL LOVE EVERYBODY-- EVEN YOU!
11-3
J.R.WILLIAMS
WHEN NOT TO LOOK
T. M. REG. U. S. PAT. OFF. COPR. 1944 BY NEA SERVICE, INC.

Small Companies to See Additional Warehouse Stocks

Washington

• • • **A plan** to increase steel stocks in warehouses to insure that small companies get their share of steel during the period of reconversion is being studied by WPB, it was announced on Oct. 31. This was told to a recent meeting of the Steel Warehouse Advisory Committee by WPB Chairman J. A. Krug.

Mr. Krug said that small producers have expressed concern that big consumers will get the bulk of steel in warehouses, leaving the minor quantities for the "little fellows."

At present the warehouse industry is selling 1,100,000 tons of steel products quarterly compared with 780,000 tons sold in a quarter in the first half of 1942, WPB officials reported. WPB said that the tonnage increase is largely the result of the availability of greater stocks and inventory restrictions placed on consumers by WPB.

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The CONE AUTOMATIC MACHINE COMPANY

sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

A recent survey shows that 89% of the tire and rubber companies and 86% of the paper companies will have new products to offer after the war. 58% of all manufacturers questioned have something entirely new for post-war customers.

get ready with CONE for tomorrow

A new heat-treated glass is in production that resists thermal shock and temperatures to 650° F.

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One of the large tire manufacturers has just patented a tubeless, uninflated automobile tire.

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Bimetallic cylinders for internal combustion engines, in which a copper sleeve is bonded to a cast iron cylinder, promise to lessen greatly the problem of heat transfer that has always interfered with high performance.

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Indium, once worth $20,000 an ounce, now costs $7.50.

get ready with CONE for tomorrow

A plant has just been opened to rebuild completely automobiles by the production line method to new car standards.

get ready with CONE for tomorrow

Aircraft engineers imagine that the big airlines of the future will dispense with landing gear entirely and will be electronically guided into a wheeled cradle at each landing field.

get ready with CONE for tomorrow

The same type of mechanism now used to stabilize the guns of moving tanks could be used to provide smoother riding trains.

get ready with CONE for tomorrow

Foam rubber is expected to replace familiar upholstery construction in automobile seats, saving nearly a foot in the length of the body.

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One big national picture magazine plans to print entirely in full color after the war.

Factory roofs actually supported solely by air blast from ventilating fans are in use and are the subject of serious experiment.

get ready with CONE for tomorrow

Snap-on molded rubber covers are now being used to mask those parts of electro-plated objects which must remain bare.

get ready with CONE for tomorrow

San Francisco has a plan for a 25 million dollar "World Trade Center" covering twelve blocks of its water front and including a free trade zone.

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Glass jewels, for instrument bearings, can now be turned out automatically at the rate of 3,500 per day. They are preferable in some respects to natural sapphires.

Through careful research and improvement, one familiar office machine has had 94 per cent of its noise eliminated or absorbed.

get ready with CONE for tomorrow

Electrically conductive rubber is being used to heat aircraft guns and propellers.

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By the use of a resin extracted from Southern pine, foundries have been able to reclaim old sand and reduce their consumption of new sand as much as 75 per cent.

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A new filtering material, made of pure rubber latex, has as many as 6,400 holes to the square inch.

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A new adhesive bonds wood to metal, making possible a new product consisting of a 1/48" ply of wood combined with a thin layer of sheet steel. This material can be readily cut and bent, and is decorative, durable, and fireproof.

Automatic Production

at

automatic-cannon speed

The 1⅝" 8-Spindle Conomatic produces these 20mm. tracer bullets in 8 seconds each. Production like this keeps shell supplies ahead of the requirements of rapid firing guns. Conomatics, in wartime, are a military necessity — in peacetime, an economic necessity.

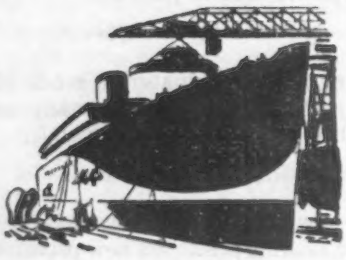
CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.

11

WEST COAST . . . OSGOOD MURDOCK

• Unions tie up 22 ships in jurisdictional dispute . . . Foundrymen standardize sands, mold materials and methods.



SAN FRANCISCO—Northern California celebrated Navy Day last week by convicting 50 sailors of mutiny for refusing to load munitions, while simultaneously Bay Area machinists tied up 22 ships in a jurisdictional dispute.

The ships involved include some of the hottest high-priority vessels under contract and lie at five different combination and repair yards, Moore, General, Matson, United and Hurley. The dispute centers around three local unions, the San Francisco AFL Machinists Local 68 (which recently precipitated the seizure of 104 machine shops by the Navy), the East Bay CIO Machinists Local 1304 on one side of the battle, with the AFL Steamfitters Local 590 on the other.

Three points are at issue in the dispute. The first, the wage rate for repair work versus new construction which was thought to have been settled at the recent Shipbuilders Stabilization Conference. This meeting dealt with AFL wage rates alone, although the CIO machinists stood side by side with AFL officials and were understood to have "taken note" and been in agreement with the findings. Present developments indicate that this impression was a mistaken one. However, interest in this point has subsided somewhat in abeyance to the second and more involved point.

The second important factor at issue is the jurisdictional problem of which craft shall install high-pressure valves, copper tubing and brass work.

The third point raises the question of which craft shall install certain other types of equipment.

The argument dates back to contracts signed in 1925 assigning installation rights to respective crafts supplemented by a temporary agreement reached in 1938, and a union president's working agreement signed in 1941.

The machinists' current actions are based on the 1938 arbitration award. The pipefitters maintain that the 1941 agreement, under which all other coast yards are currently operating, still holds good.

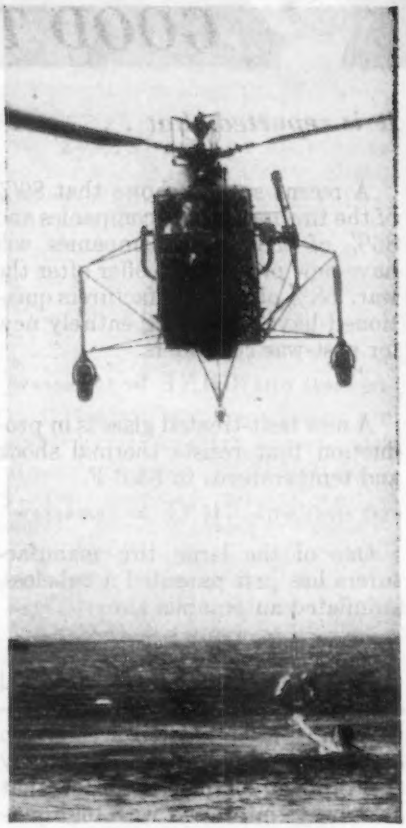
Since the AFL machinists declined to work the first ship the trouble has ramified. They were subsequently backed up by their CIO brothers, who also refused to work ships in the same category. Pipefitters remained at work and machinists accepted reassignment to other vessels. Machinists, operating toolrooms, refuse to issue material or tools to pipefitters on ships under dispute. Work stoppage spread to new vessels and machinists not only walked off the ships in question but walked out of the yard. Number of vessels on which work is halted has grown to twenty-two.

Employers, many of whom came up the ranks of the machinist's trade, look with a jaundiced eye on claims of their former brothers, but in order to hold their personnel, assign machinists to jobs where they must standby. Pipefitters charge employers with favoring machinists. Machinists offer a proposal to set aside all past agreements covering jurisdictional disputes and allow employers to designate who shall do the work. The pipefitters counter, saying, "That's the same as the fellow with the five dollar bill. Another fellow comes along and says, 'Let's get an impartial observer to decide whom that five dollar bill belongs to.'"

As event follows event, blood grows hotter and undercover developments are reported in labor circles. One report declares that, in spite of "no strike" agreements, unanimous signed consent from one local authorizes a strike.

Another states that machinists coming on one job where steamfitters had completed one of the controversial installations, tore out the equipment and only replaced it when level heads raised the question of Federal prosecution for sabotage.

Third rumor, from authoritative sources but obviously difficult to confirm, declares that the whole trouble started when one official signed a jurisdictional agreement with another while under the influence of entertainment.



SEA RESCUE HARNESS: *In continued efforts to develop more effective sea rescue methods the Navy is testing a special rig attached to a Sikorsky helicopter. A Coast Guardsman is reaching for the harness.*

Federal conciliators fail to effect a settlement, the dispute is referred to Washington, then cancelled. The WLB orders AFL machinists back to work but fails to mention CIO machinists who entered the dispute later. It is believed that the order inferentially covers the CIO, but in the meantime machinists continue to walk off jobs and absenteeism grows.

The third point at issue, still minor and not yet brought into the open, involves the boilermakers and shipfitters. Machinists have already refused to issue them materials from toolrooms for ships under dispute. No one refers to the fact that machinists maintain that straphangers for pipes should also be hung by their craft. Under terms of the present agreement this work is being done by boiler-

Greater ACCURACY REQUIRED

New Production Speeds and Improved Part Finish Place Emphasis on PRECISION-MADE Cutting Tools

XLO

Since 1919 The Continental Tool Works (a division of Ex-Cell-O Corporation) has been producing special and semi-standard cutting tools to customers' drawings or part prints—until today the Continental name in the cutting tool field is commonly used as another word for "accuracy and quality." This long experience, coupled with the most modern and complete facilities, makes Continental the first choice as a cutting tool source for manufacturers planning their re-tooling for tomorrow's huge production. *Find out now how you can be assured of high production efficiency*—get in touch with the nearest Ex-Cell-O representative or write to Continental Tool Works Division, Ex-Cell-O Corporation, Detroit 6, Michigan.

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DETROIT 6, MICHIGAN

SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES • SPECIAL MULTIPLE PRECISION DRILLING MACHINES • PRECISION THREAD GRINDING, BORING AND LAPPING MACHINES • BROACHES AND BROACH SHARPENING MACHINES • HYDRAULIC POWER UNITS GRINDING SPINDLES • CONTINENTAL CUTTING TOOLS • DRILL JIG BUSHINGS • TOOL GRINDERS • FUEL INJECTION EQUIPMENT R. R. PINS AND BUSHINGS • PURE-PAK PAPER MILK BOTTLE MACHINES • PRECISION AIRCRAFT AND MISCELLANEOUS PARTS

makers. Shipbuilders realize that there aren't enough machinists to handle the periodic employment peaks, that not one machinist in a hundred knows how to weld and that drilling and bolting would raise the cost, slow down the job and create another manpower bottleneck.

Boilermakers stand by, unions tighten their grip on their share of work, ships "more desperately needed than combat vessels" lie idle and 50 U. S. sailors await sentence on charges of mutiny.

A RECENTLY completed report on foundry sands and mold materials by the Northern California Chapter of the American Foundrymen's Association marks the first step in standardizing materials and practice for the industry here.

Inaugurated under Harry A. Bossi of the H. C. Macaulay Foundry, chapter president, and coordinated by George L. Kennard, secretary, the preliminary report will be continued under Ralph C. Noah, of the S. F. Iron Foundry, new chapter president.

Sub-committees will be divided into three main groups, Steel, headed by Milton Oakes, American Manganese Steel Division, Gray Iron, headed by Harold E. Henderson, and Non-Ferrous, with William Burt, Berkeley Brass Foundry, for chairman.

This year's preliminary survey covers both practice and material, the character of sand in use and under development—both western and eastern. The report indicates that the trade has a well defined tendency toward the use of Ottawa (Illinois) sand blended with a fine sand in preference to Pittsburgh (California) sand. This trend is particularly pronounced with the present shortage of imported Belgian sand.

Offshoot of this aspect of the situation is the renewed activity of Nevada property owners to perfect a refining process for their sands which will enable them to beat the Ottawa price-plus-freight-rate and the low-cost Belgian sand into the western market.

Several attempts to deliver a high quality Nevada sand have not proven altogether successful. One firm is reported to have just ironed out its production wrinkles and made a successful test run. Although not yet under full production it is believed to be about ready to go after the local market. In addition to the refining problem, another obstacle to a development along this line is the foundrymen's practice of using Ottawa, and one supplier for all needs.

Second well defined trend according to the report, is a preference for the green sand drying method over skin drying or oven drying.

Third finding of the committee was the lack of uniformity in the unit of measurement employed by members. Units reported in the compilation ranged from tons through gallons, pounds, quarts, and parts to per cents.

Pursuing standardization of practice the committee has prepared, though not yet ready for general release, a suggested conversion table:

Bond Ratio, Binder to Sand by Volume	Binder, Gal. per Ton of Sand
1 to 10	13.5
1 to 20	6.75
1 to 30	4.5
1 to 40	3.4
1 to 50	2.7
1 to 60	2.25
1 to 70	1.9
1 to 80	1.7
1 to 90	1.5
1 to 100	1.35
1 to 110	1.2
1 to 120	1.1
1 to 130	1.0
1 to 140	0.9

Note: Tapping the container will pack the dry sand or binder and amount measured will vary. Also, weight of dry sand will vary 12 to 14½ lb. per gal. depending on sand type and grain size.

Sand 1 cu. yd.—202 gals.—3000 lb.—27 cu. ft.
1 cu. ft.—7.5 gals.—110 lb.
1 ton— 135 gals.
1 gal.— 231 cu. in.—14.5 lb.—4 qts.—8 pts.

Core Oil .....7.5 lb. per gal. approx.

Corn Flour
Cereal .....4 lb. per gal. approx.
Rosin .....9 lb. per gal. approx.
Water .....8.3 lb. per gal.

Magnesium Sand Inhibitors:
Powdered sulphur .....4.20 lb. per gal.
Powdered boric acid....5.75 lb. per gal.
Diethylene glycol .....9.30 lb. per gal.

Continuing studies by the respective committees are underway and will be supplemented by further research.

Although printed in an extremely limited edition, copies of the major report are still available.

Recommend Bidding On Lend-Lease Steel

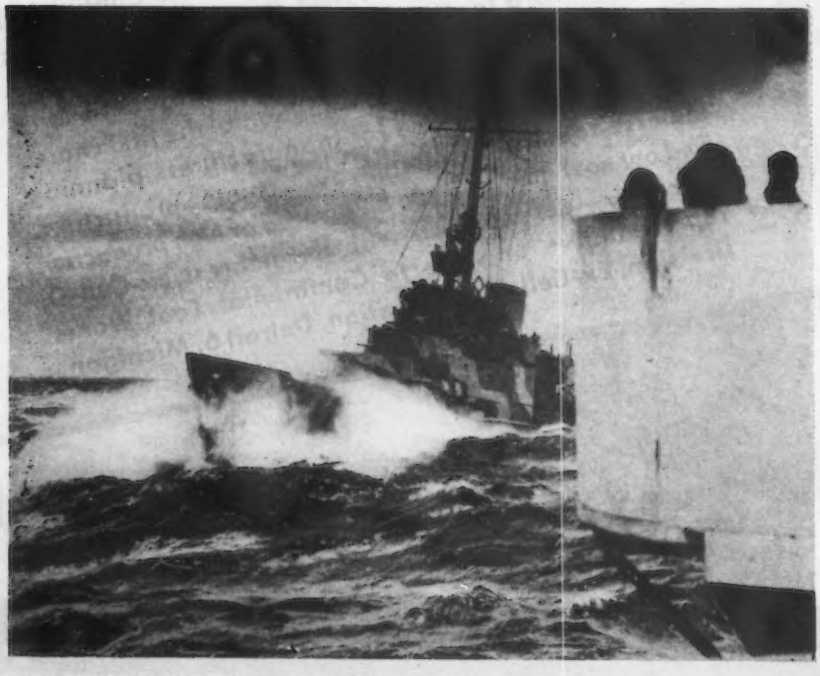
Pittsburgh

• • • With the recent bobtailing of lend-lease shipments, which are expected to be cut to an even greater degree after the first of the year, it has been recommended by the WPB that the Treasury Department handle these requirements on a bid basis; thus eliminating the present lend-lease procurement arrangement.

WPB, of course, will have to allocate the tonnage of steel to go into lend-lease, but it is felt in some WPB quarters that greater efficiency and less burden on specific steel producers would result from letting those producers who desire lend-lease business bid on such orders and fill the contracts.

This recommendation is for lend-lease business after Jan. 1, 1945, since orders for shipment during the remainder of this year have already been placed. Orders for steel amounting to about 200,000 tons have been placed, but it is doubtful that even all of this will be shipped. There are still close to about 250,000 tons of lend-lease steel that are still awaiting shipment from this country.

ATLANTIC STORM: *Coast Guard combat cutters rendezvous somewhere in the North Atlantic during a storm that washes the deck of both vessels. They are carrying out routine duties on the convoy shipping lanes.*



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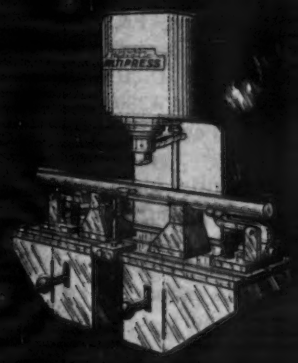
AN ENTIRELY NEW KIND OF INDUSTRIAL TOOL



With Straightening Fixtures

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Showing Dial-Type Feed

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With Motor Driven Indexing Table

For Scores of Production Jobs

A 4-ton production giant in midget form . . . a completely self-contained, bench-size, oil-hydraulic machine tool of amazing scope. MULTIPRESS delivers downward ram pressures of from 300 to 8,000 pounds . . . upward pressures to 5,000 pounds . . . in strokes which may be regulated from 6 inches to 1/16-inch . . . at ram speeds up to 200 inches per minute downward, and 300 upward! Its work-table measures 10½ x 16 inches without extensions. The opening between ram and table is 11 inches. In addition, there are fixtures and attachments for MULTIPRESS which fit it for almost every type of operation requiring pressure . . . sustained, in repeat strokes, synchronized with indexing tables, in single or automatically repeated cycles, and many other ways! Write today for details on this new HydrOILic tool of multiple uses!

Basic Unit **$575.00** f.o.b. Col's.

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1158 Dublin Road, Columbus 16, Ohio

DENISON EQUIPMENT in APPLIED HydrOILics

HydrOILics INDUSTRY'S RIGHT HAND

PERSONALS

• **F. E. Leib** who has been with the Copperweld Steel Co., Glassport, Pa., since 1936, has been appointed assistant general manager of sales. **C. H. Jensen,** with the company since 1930, has been appointed electrical engineer.

• **Daniel W. Talbott,** recently plant superintendent of the Symington Gould Corp., Rochester, and previously with the Ohio Steel Foundry Co., has been appointed general manager of the Cooper Alloy Foundry Co., Hillsdale, N. J.

• **Daniel E. Wise,** formerly project engineer for the Carnegie-Illinois Steel Corp. in the Youngstown, Ohio, district, has been promoted to assistant chief engineer of the corporation's Clairton Works.

• **Albert Hanson** has been promoted to vice-president in charge of engineering, Drayer & Hanson, Inc., Los Angeles. **J. C. Lombardi** has been appointed as vice-president and director of sales; **Scott M. Hauser,** vice-president, has become director of sales promotion and advertising and **A. H. Witt** has become sales manager of air conditioning and refrigeration.

• **Victor Failmezger,** formerly application and field engineer for the H. K. Porter Co., Inc., Pittsburgh, has been made sales manager of its subsidiary, Quimby Pump Co., Newark and New Brunswick, N. J. He was associated with Westinghouse Electric & Mfg. Co. and Worthington Pump & Machinery Corp. in both sales and application engineering in the 15 years prior to joining the Porter organization.

VICTOR FAILMEZGER, sales manager, Quimby Pump Co.

• **Thomas W. Cunnea** has been appointed branch manager of the Westinghouse Electric Supply Co.'s Houston, Tex., office. **Charles G. Lammers** has been made manager of the Indiana division.

• **George Mast** has joined the Milwaukee Metal Spinning Co., Milwaukee, as engineering and production supervisor. He started his career with Link Belt Co., Chicago, as draftsman, and for the past 16 years was associated with the Creamery Package Mfg. Co., Fort Atkinson, Wis., as development engineer and factory superintendent.

• **John Godleskie** has been appointed field engineer in the Michigan territory for the Bison Forge Co., Buffalo, with offices in Detroit.

• **Sperry L. Searles** has recently been elected president of H. B. Fuller Equipment Co., Cleveland.

ALLISON L. BAYLES, vice-president American Engineering Co.

• **Allison L. Bayles** has been elected vice-president of the American Engineering Co., Philadelphia. He comes from the Rogers Diesel & Aircraft Corp., New York, where he was director of research and development. Prior to that he had been associated with its predecessor company, Hill Diesel Engine Co., Lansing, Mich.

• **William P. Michell** has been made assistant chief engineer of Mack Trucks, Inc., New York. He has been with the company since 1923.

• **A. H. Krut,** formerly New York sales manager has been made director of sales for the C. G. Hussey & Co., Pittsburgh, a division of the Copper Range Co., Boston, Mass. **Edward Abrams** has succeeded Mr. Krut in the New York area.

• **George Green** has been made vice-president in charge of sales for the Mt. Vernon Car Mfg. Co., Mt. Vernon, Ill., a division of the H. K. Porter Co., Inc., Pittsburgh. Mr. Green in the past year served as railway sales manager of Elastic Stop Nut Corp., Union, N. J.

EDWARD C. FALES, assistant to the president, American Welding & Mfg. Co.

• **Edward C. Fales** has been appointed assistant to the president of the American Welding & Mfg. Co., Warren, Ohio. Mr. Fales comes to American Welding from Sylvania Electric Products Co., Salem, Mass., where he was assistant to the general manager of operations. Prior to that he was associated with the Carnegie-Illinois Steel Corp. as an industrial engineer.

• **Dave W. Choate** has been named industrial manager at Atlanta, Ga., for Minneapolis-Honeywell Regulator Co. and its precision industrial instrument division, the Brown Instrument Co. Mr. Choate started with the Brown company in 1936 and has been in charge of the Milwaukee branch of that company's activities. **W. S. Robards** has succeeded Mr. Choate as industrial sales engineer of the Milwaukee branch.

• **Frank Schryer** has been appointed plant superintendent, L. J. Mueller Furnace Co., Milwaukee.

S. L. EASTMAN, chief engineer, Cleveland Worm & Gear Co.

• **S. L. Eastman** has been appointed chief engineer of the Cleveland Worm & Gear Co., Cleveland. He has been connected with the company in various capacities since 1927, first in the testing laboratory, later serving as sales engineer and assistant sales manager. Since 1942, he has held the position of assistant chief engineer.

• **L. G. Jacques**, a vice-president of Motor Products Corp., Detroit, has been elected general manager of the company.

• **J. Russell Gnau**, formerly assistant to Charles E. Sorensen at Ford Motor Co., has been appointed office manager of Ford. He replaces **A. G. Coulter**, who has been made assistant Dearborn branch manager under Harry Mack.

• **Robert B. Algie** has been appointed resident manager of sales of the new Connecticut office of Jones & Laughlin Steel Corp., Pittsburgh.

• **Lee F. Sickler**, formerly associated with Ampco Metal Inc., Milwaukee, has been appointed works manager, Maysteel Products, Inc., Mayville, Wis.

• **Dr. Richard M Hitchens** has been appointed associate research director of the Organic Chemicals Division, Monsanto Chemical Co., St. Louis. He has been with the company since 1931, starting as a research chemist, and most recently as assistant research director.

• **R. E. Shafer** and **R. S. Henry** have been appointed sales manager and purchasing agent, respectively, The Wheland Co., Chattanooga, Tenn.

. . . OBITUARY . . .

• **Charles C. Worthington**, internationally known industrialist, died October 21. He was 91 years old. Mr. Worthington, who had operated pump plants in England, Germany, Austria and France, formerly was president of the International Steam Pump Co., the Henry H. Worthington Pump Mfg. Co., founded by his father, the Holley Steam Pump Co. of Buffalo and the Worthington Automobile Co. At the death in 1880 of his father, Henry H. Worthington, he took over the affairs of the Worthington Pump & Machinery Co. He sold his interests in 1889, becoming president of the International Steam Pump Co. until 1900, when he resigned to devote himself to the automobile industry.

• **William Bausch**, chairman of the board of Bausch & Lomb Co., Rochester, N. Y., and last surviving son of John J. Bausch, company founder, died October 19. He was 84 years old. Mr. Bausch, who was active in the firm's scientific research until his death, was named board chairman in August to succeed his brother, Edward, who died July 30. He was credited with being instrumental in establishing production of optical glass in this country in 1916. Mr. Bausch had been with the company for over 69 years.

• **Edgar Highley**, 63, superintendent of the Dunkirk wire mill of the Allegheny - Ludlum Steel Corp., Pittsburgh, died October 16. He was associated with the Jones & Laughlin Steel Corp. for many years before going to Dunkirk to found the wire mill 26 years ago.

• **John H. Goss**, retired president of the Scovill Mfg. Co., Waterbury, Conn., died October 16. He was 72 years old. Mr. Goss, who became chairman of the board when he resigned as Scovill president and general manager on September 22, had celebrated his fiftieth anniversary with the company on September 12.

• **Dr. Carl Claus**, vice-president in charge of research, Bound Brook Oil-Less Bearing Co., Bound Brook, N. J., died suddenly October 5. He was with the company 23 years, and was one of the first to carry on sustained research in the art of powder metallurgy.

• **Ivar W. Alin**, president and general manager of the Superior Tool & Mfg. Co., Worcester, died October 17. He was born in Sweden 62 years ago.

• **Fred H. Clausen**, 68, president of Van Brunt Mfg. Co., Horicon, Wis., and a director of Deere & Co. died October 21. He was a vice-president of the United States Chamber of Commerce and of the National Founders Association and a former vice-president of the Farm Equipment Institute.

• **Otto B. Kibele**, 73, general superintendent of the Western Pipe & Steel Co. of California shipyard at South San Francisco, died recently. Mr. Kibele had been Los Angeles Harbor Commissioner and former head of his own shipyard, the Park & Kibele Boat & Ship Repair Co. at San Pedro. He joined Western Pipe & Steel in December, 1941.

• **John T. Tierney**, president of the Koppers United Co. and chairman of the board of the Koppers Co., Pittsburgh, died October 25. His age was 61 years. Mr. Tierney joined the Laclede Gas Light Co., St. Louis, in 1908, remaining until 1916, when he joined Koppers as superintendent of the Seaboard By-Products Coke Co. He was appointed manager of the plant in 1923 and became vice-president of the Koppers Gas & Coke Co. three years later, serving until 1933, when he was made president of the Koppers United Co. and the Koppers Co. In 1939, he became chairman of the executive committee of the board of trustees of the Koppers United Co., continuing as its president.

• **Joseph S. Pendleton**, secretary-treasurer of the Carpenter Steel Co., Reading, Pa., died suddenly October 7. Mr. Pendleton joined Carpenter in 1897 as assistant chemist. This was the start of his business career, all of which was spent with the company.

• **Thomas P. Anthony**, 65, consulting engineer and former chief engineer of the U. S. Pipe & Foundry Co., died at his home in Edgewater Park, N. J., on October 7.

• **Frederick B. Cooley**, 68, chairman of the board of the New York Car Wheel Co., Buffalo, died October 12. He had been associated with the company since 1913.

• **Martin Pusch**, veteran Milwaukee foundryman, who was with the Allis-Chalmers Mfg. Co., Milwaukee, for 52 years, died October 11, at the age of 81 years.

Fatigue Cracks . . .

BY A. H. DIX

Message To London

• • • If our pres. and ed. dir., John H. Van Deventer, has time before he leaves England, we hope he will look in on C. R. Casson Ltd., at 29 Hertford St., London, W. 1. This is the agency responsible for our favorite advertising series—the one on Desoutter portable tools.

What we would like our pres. and ed. dir. to find out is what is an "Executives Department." That is what is signed on a letter just received from Casson. It gives us the impression that all the executives are bunched together in one department. This is a novel idea and we would like to know how it works, especially what happens to the headless departments.

The man to ask for is Mr. Ramesy—G. Ramesy. That looks like a typo for "Ramsey," but "Ramesy" is how we make out the signature. (*Good chance to put in a plug for the American custom of typing the name below the signature.*)

New Ribbon for Hugessen Breast

. . . As a candidate for your Distinguished Name Club how about our Sir Hughe Knatchbull Hugessen?

—*I. A. J. Duff,*
Woodside, Oakley Green, Windsor, England

Sir Hughe is in without even bothering to call for a show of hands. That makes seven—Colonel Oveta Culp Hobby, Dr. Icie Macy Hoobler, Dingle Mackintosh Foot, J. Flipper Derricotte, Imo Alma Yoho (and a bottle of rum), Guy Passmore Bible, and, of course, Sir Hughe Knatchbull Hugessen. Rhymes with *possessin'*.

But None for O-C-F Man

• • • Rejected is a candidate sent in by J. H. (Marley Co., Inc.) Roush. The sole qualification of his offering, who is with Owens-Corning Fiberglas at Toledo, is an unusual family name. The Club is for people who are not only blessed with gallant given names but who do something with them. Example: H. K. Hugessen would not get in, nor would Hughe K. Huggessen. The Knatchbull is what does it.

No Royal Road

• • • Mr. Duff himself owns one of those purling English addresses that we have been eyeing enviously—*Woodside, Oakley Green, Windsor.* Our fear that the art of coining them is unexportable, like Scotch whiskey distilling, is confirmed in parable by Harold M. (Southwest Welding & Mfg. Co.) Huston, who writes:

An American who admired a beautifully groomed English lawn asked a gardener for the recipe. The gardener said, "Yes, sir, I can tell you what to do. You have only to mow and roll it regularly twice a week—and keep on doing it for two hundred years."

Which means that another century or more must pass before we shall have acquired the knack of creating those smoothly articulated addresses the England turn out with the careless ease with which an expert bartender assembles a side car.

We shall leave the subject now, pausing only to close our eyes and pull one more gem at random from the jewel case which is our English stencil file. It reads, "*Mr. J. Higgins, 64 Windmill Lane, Raddish, Stockport, Cheshire.*" Every one a pure blue-white.

Paper Paradox

• • • We read this headline last week in the New York *World-Telegram*, "*12,000 Warnings and 700 Summonses Issued to New York Householders for Failure to Separate Loose Paper from Refuse.*" The same day one of our representatives was told by a Newark, N. J., manufacturer that he had no luck at all in getting rid of about a half ton of paper, consisting mainly of old copies of this and other technical journals. He said he would have to burn it, as he could not even give it away.

As paper is our major breakfast, lunch and dinner food, we are vitally interested in seeing this weak link in the waste paper collection chain repaired, and if the authorities concerned will write to us, we will supply particulars.

Jackpot-Hitter

• • • The interested authorities will find our address near the top of the first column of the contents page. Or they may wish to use a device discovered by a Philadelphian:

Years ago I solved the problem of finding your address. I turn to the help and situations wanted ads, and there it is, dozens of times on the same page—"address Box . . . . . , care The Iron Age, 100 E. 42nd St., New York 17."

You may pass this on to your other readers, with or without my compliments.

—*J. Malvern Benjamin*

Astonished, Amused Was He

• • • Last week to Hot Springs, Va., went bemustached, cigar-smoking Frank Joseph Oliver, technical editor of this journal. Purpose: to report the National Machine Tool Builders' Association's meeting (see page 111).

Bowled over was he, after a fruitless, nationwide search for ten-cent or less cigars, to find, at swank Homestead, White Owls at 6c.

Amused was he over sign in Homestead rooms, "*The management does not object to the presence of a small, well-mannered dog.*" A lady guest paraded with a wolfhound. Whether well-mannered, Mr. Oliver learned not, but large, it, the wolfhound, was.

Orchid From Lady

• • • Which reminds us to mention that a lady unknown to us paid your favorite family journal a pretty compliment in the Cleveland terminal station at 5:45 P. M. two weeks ago today. We were a member of a large crowd awaiting the New York train. In our arm we held a pile of convention literature flanked by the current issue of this journal. A lady of middle years said to her companion, "George, there's someone else from the convention. He has that magazine we see every place." We, she and he smiled.

Odorous Typo

• • • I quote from the *Muskegon Chronicle:*

Members of Local 13 UAW-CIO voted to return to work at two Nash-Kelvinator plants until Monday pending action by the WLB. The action was taken after Jack Holt, sub-regional director for the International union, said the company was "in fragrant violation of the contract. . . ."

There is a certain odor. . . .

—*Roy S. Harvey, General Purchasing Agent, Sealed Power Corp., Muskegon 61, Mich.*

Puzzles

• • • Last week's stream flowed 2 miles an hour.

Charles S. (Hoskins Mfg. Co.) Kinnison and D. A. (Delco-Remy) Cotton agree that 21.71 ft. is the answer to the Oct. 12 problem about the length of a 10-in. board placed inside a 20 ft. by 10 ft. rectangle.

We apologize for giving the wrong answer to the one about the New York-Lisbon ships, which read, "Every day at noon a ship sails from New York to Lisbon, and every day at noon a ship sails from Lisbon to New York. The trip takes exactly 4 days. How many ships from Lisbon will each ship from New York meet?" We gave the answer at 17, which is wrong. Our puzzle book deceived us. The answer is 9.

This one, sent in by W. J. MacDonald of the Emsco Derrick & Equipment Co., Los Angeles, is not pristine, but old puzzles, like old jokes, are reborn at least every five years:

A man has a garage 10 ft. wide by 10 ft. high. Touching one side is a flag pole 100 ft. in height from the ground. During a windstorm the pole breaks at a point which permits the broken portion to fall so that it leans against the edge of the roof on the opposite side of the garage, with the tip just touching the ground. What are the lengths of the two parts of the pole?

VICTORY TECHNIQUES

you dare not do without

The magnificent production achievement of a Free America that overcame a ten-year start and overwhelmed the axis with ships, planes, arms and ammunition, *moved industry ahead fifty years.*

Peacetime production will be unable to compete without the Victory Techniques that helped to win the war and obsoleted much of our prewar facilities. For the truth of the matter is that with a need so great, unlimited amounts of money and energy went into the development of new materials, new fabricating processes, new metallurgical treatments, new assembly methods and new transportation facilities.

The competitive pace of peacetime production will be so fast that if you do not know these new Victory Techniques, you simply can not survive. Shrouded with wartime secrecy they are coming to light one by one.

Learn what they are *now*. See your machine tool representative, your electrical equipment man, your heat-treating furnace salesman, your representatives for materials and services of every kind. Find out what changes in every line the war techniques have brought about. Victory Techniques helped to win the war . . . now they are going to win the peace.

Your Lindberg Furnace representative is eager to do his share to help you with any metallurgical problem.

LINDBERG ENGINEERING COMPANY
2452 WEST HUBBARD STREET, CHICAGO 12, ILLINOIS

ARMY E NAVY

Lindberg FURNACES

SUPER-CYCLONE for hardening, normalizing, annealing, tempering
CYCLONE for accurate, low-cost tempering and nitriding
HYDRYZING for scale-free and decarb-free hardening

Dear Editor:

MEMO SPACE ON COVER

Sir:

As a suggestion, can you leave a space on front cover on which to make notes? If I see an item I note it on the cover. Sometimes there is no space.

J. J. LANDIG

● The gummed routing slips, furnished by us free of charge, are ideal for this purpose. For a supply write to us at 100 E. 42nd St., New York 17.—Ed.

TIME AND MOTION STUDY

Sir:

This item appears in your "Coming Events" column of a recent issue, "Nov. 2-3—Industrial Management Society, National Time and Motion Study Clinic, Chicago."

Can you give me the address of the sponsoring society?

W. E. NORTON
Henry Disston & Sons, Inc.,
Philadelphia 35

● The Industrial Management Society is at 205 W. Wacker Drive, Chicago.—Ed.

PRECISION CASTINGS

Sir:

I read with considerable interest your article, "Industrial Precision Castings By a Manufacturing Jeweler," which appeared in your Sept. 7 issue. I would appreciate very much receiving a reprint.

D. S. EPPELSHEIMER,
Acting Director
University of New Hampshire,
Durham, N. H.

● See also "Industrial Precision Castings," page 82 of last week's issue.—Ed.

ALUMINUM SCRAP

Sir:

Your *News Front* of Oct. 5 contains this statement, "Aluminum scrap, currently a drug on the market, has recently been sold at less than $2 a ton." Will you kindly give us details. Is this scrap castings or does it cover aluminum chips, or possibly some other form of aluminum material?

L. J. HARLEY, JR.,
Vice-Pres. and Gen. Manager
Lincoln Machine Co.,
1079 Main Street,
Pawtucket, R. I.

● This price, which was reported by a government official engaged in the disposal of war surpluses, is not representative of aluminum scrap prices. Remelters are now paying from 1c to 1¾c lb. for aluminum turnings on a dry basis. While the official who made the statement was not specific as to the type of scrap, it was probably either compressed used aircraft or turnings containing large amounts of oil. Accumulations of the former are common in West Coast areas and there have been instances reported where dealers have been called in to remove such accumulations free of charge in order to clear space.—Ed.

NON-FERROUS SPECIFICATIONS

Sir:

We are interested in the Non-Ferrous Alloy Specifications, pages 66 to 98 of your Sept. 14 issue. I think this is one of the most constructive items you have published lately and it is information that is required by most operators in our field just about every day. Would it be possible to get ten extra sets?

Your magazine has been most beneficial in our operations. Your articles, information and other matter have been most constructive.

E. O. GARRETT
Henger-Seltzer Co.,
130 So. Hewitt St.,
Los Angeles 12

Sir:

The Non-Ferrous Alloy Specifications in your Sept. 14 issue will prove of inestimable value to us in our estimating. If you have reprints we would like to obtain six.

J. R. VANCE,
Non-Ferrous Castings Div.
Briggs Manufacturing Co.,
12825 Taft Ave.,
Cleveland

Sir:

Would it be possible to obtain a reprint of your excellent article on Non - Ferrous Alloy Specifications, pages 66 to 98 of your Sept. 14 issue?

CHARLES A. GODEFROY,
Chemical Engineer
1024 E. Wilson Avenue,
Glendale 6, Cal.

● The tables, reprinted in pocket-sized booklet form, are now available, price 25c for single copies, 16c each for 10 or more.—Ed.

TIME STUDY

Sir:

The series of articles you have been publishing on time study are of great interest to us. Could we get two copies of each part of the series?

CATHARINE ROZIER,
Librarian
Curtiss-Wright Corp.,
Airplane Division,
St. Louis, Mo.

Sir:

Please send me a copy of the article, "The Right and Wrong of Time Study Calculation" which appeared in your Aug. 17 issue.

A. R. McCUTCHEON,
Engineering Dept.
Evinrude Motors,
Milwaukee, Wis.

Sir:

I have read with much interest the article, "Method Simplification Applied to Time Study," by Anderson and Hansen, in your Sept. 28 issue.

This article will be of interest and value to our students and particularly to men from industry who come here for training. Because of this I would like permission to reproduce it.

RALPH M. BARNES,
Prof. of Industrial Engineering
State University of Iowa,
Iowa City, Iowa

● Permission is granted. This is the second of a series of three. The first, "The Right and Wrong of Time Study Computations," was in the Aug. 17 issue, and the third, "Your Incentive Will Work if Properly Planned," in the Oct. 19 issue. Reprints are being made of the series, together with related reports—"Evaluating Shop Jobs By the Point System," Sept. 10, 1936, issue; "Applying the Point Method of Evaluating Jobs," Oct. 8, 1936, issue; "What's Your Job Worth?" Aug 17 and 24, 1939, issues; "Job Rating," Sept. 7 and 21, 1939, issues; and "Planned Time Study Standards," Oct. 29, 1942, issue. The booklet, totaling about 48 pages, will be available at cost.—Ed.

WESTERN STEEL

Sir:

We would like four copies of your Sept. 7 issue containing the article, "Western Steel," which is certainly a fair and accurate summary of the steel situation in the west, with special reference to the unnecessary starting of the Geneva plant in Utah.

FRANK S. HOAG,
President and Gen. Manager
Star-Journal Publication Corp.,
Pueblo, Colo.

HARDENING NE STEELS

Sir:

We would appreciate it if you could tell us where we can get information on hardening procedures for NE Steels.

JOHN A. WERRY,
Quality Engineer
Specialties Manufacturing Co., Inc.,
55 Farrand Street,
Bloomfield, N. J.

● Many of the steel companies have issued booklets on the subject. One of the more comprehensive is "National Emergency Steels—Properties, Treatment and Applications," 74 pages, issued by the Republic Steel Corp., and obtainable on application to that firm's Advertising Division, 3100 E. 45th St., Cleveland 4, Ohio.—Ed.

PICKLE POLISHING

Sir:

We are interested in the process of pickle polishing for the removal of burrs after grinding and we understand that in the past you have published several articles on this subject. In what issues were they?

F. S. HERSEY,
Purchasing Agent
S. W. Card Manufacturing Co.,
Mansfield, Mass.

● Articles on pickle polishing appeared in the issues of Dec. 21, 1939; Jan. 11, 1940; April 11, 1940; May 23, 1940; and May 30, 1940.—Ed.

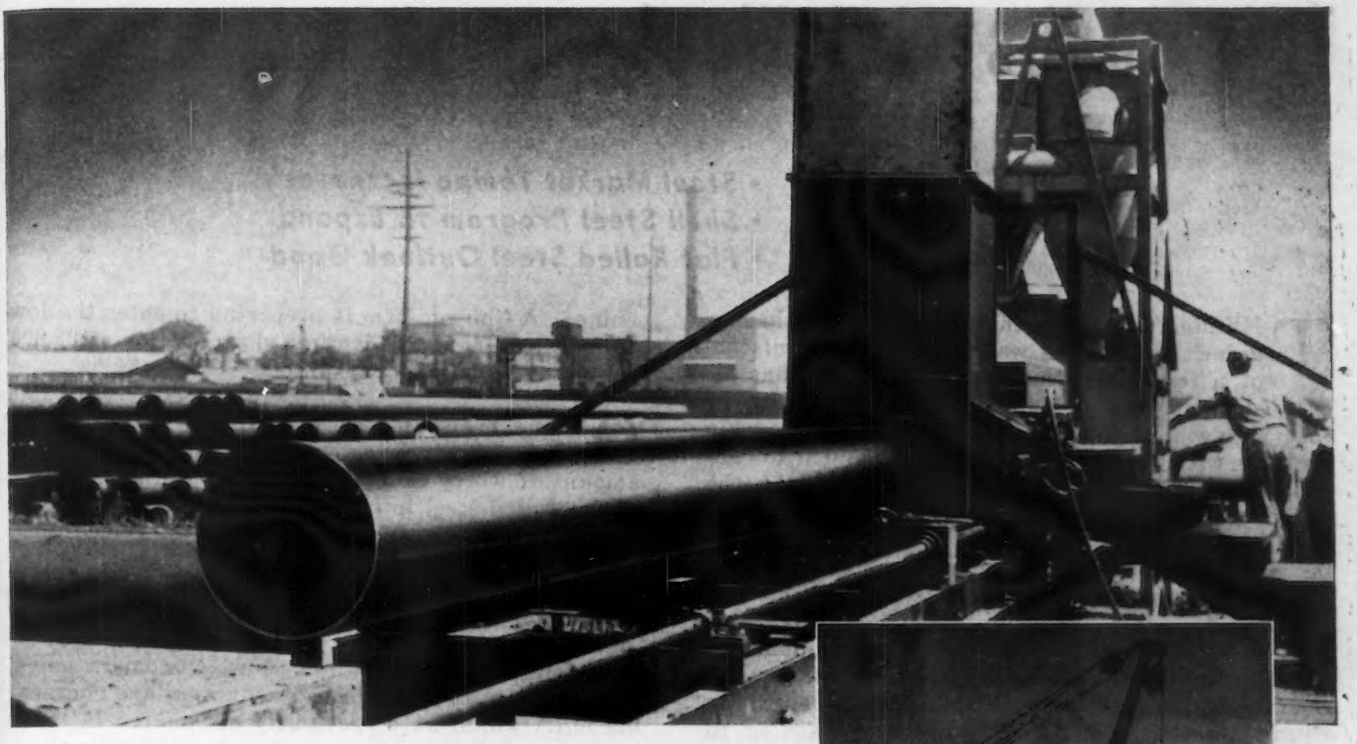
ELECTROSTATIC SPRAYING

Sir:

We would appreciate a reprint of the article, "Electrostatic Spraying and Detearing" in your Oct. 19 issue.

E. S. BARNHART,
Director of Tool & Process Engrg.
Eastern Aircraft Div.,
General Motors Corp.,
Bloomfield, N. J.

● No reprints were made but we are sending you a clipping.—Ed.



PROTECTING

America's vital underground

Upper picture shows the Wheelabrator cleaning cabinet used by the Industrial Engineering Co., for removing pipe corrosion at one of their Texas reconditioning yards. Lower picture shows the first step in reconditioning pipe . . . removing a length of corroded pipe from the ground.

The importance of America's pipe lines has been vividly brought to light by the war. They will continue in importance to our peace-time economy. But, all commercially economical metals will and do corrode. A method of combatting this corrosion and oxidation will preserve America's vital underground and save great sums. That method has been found in the coating and wrapping of thoroughly cleaned pipe. And the most effective, economical way to clean the pipe is by the Wheelabrator airless abrasive blasting process.

Some of the pipe now being cleaned the Wheelabrator way has been in corrosive soil for as long as 19 years. Due to the perfect bonding surface given by Wheelabrator cleaning, the life of the pipe is estimated to be increased from six to ten years. This superior method of preservation makes it no longer necessary for engineers to specify pipe with an excess of steel wall thickness in anticipation of corrosion losses. Thus, both steel and expense are spared.

This is but another example of the many advantages Wheelabrator offers every industry with a metal-cleaning problem.

AMERICAN FOUNDRY EQUIPMENT CO.
510 SOUTH BYRKIT STREET
MISHAWAKA, INDIANA
WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

This Industrial Week . .

- **Steel Market Tempo Increases**
- **Shell Steel Program to Expand**
- **Flat Rolled Steel Outlook Good**

THE steel market in the past few weeks has regained some of its wartime tempo reminiscent of a few months ago before cancellations increased in number. This change, which reflects the ease with which steel companies were able to plug up holes with additional business subsequent to cancellations, is just another signpost exhibiting the mixed trends which have been existent in the past month.

That the peaks were reached in steel ordering some time ago was still evident this week when order volume, although heavy, represented a slightly lower level than was the case in August and September. Furthermore, the steel ingot rate dipped this week and the orderly decline probably represents the attuning of current order volume and backlog to actual production schedules. There was evidence, however, that at least some of the decline in the ingot rate was due to the unusual time necessary to make repairs and also due to the accumulative effects of outlaw strikes, which this week were cutting into steel output at Birmingham and Buffalo.

The much tossed about steel shell program seems slated for an extra stimulus in December and in the first quarter of 1945. October shell requirements were about 213,000 net tons. At present November and December needs are about 302,000 net tons. However, there is a good chance that by December shell steel needs might expand to as much as 325,000 tons or possibly 350,000 tons. Original estimates on requirements made some time ago had brought out a figure of about 450,000 tons a month by January, 1945. If the heavy ammunition program begins to expand, as now seems likely, it will offset to some extent easiness in the plate and structural markets.

District reports on the speed with which mills are receiving new business were by no means uniform this week. At Philadelphia new orders were light and substantially in balance with shipments. According to reports there, this easier situation was attributable to a sharp drop in maritime orders.

PITTSBURGH market news was highlighted this week by two sheet inquiries, one for 7700 tons of light gage galvanized corrugated sheets for Navy barracks buildings, and another anonymous inquiry for 5000 tons of light gage cold rolled corrugated sheets. The latter inquiry is believed to be for temporary warehouses in which to stock surplus government-owned materials upon contract terminations.

The end of October at Chicago found war business plugging gaps in rolling mill schedules to such an extent that deliveries on most items were no better than a month ago.

Nevertheless, postwar steel news was piling up this week. A major appliance manufacturer is making preparations to place sheet orders for 45,000 refrigerators, 30,000 stoves and 30,000 washing machines. A Chicago firm is preparing to enter the low temperature field with an initial production of 25,000 cabinets and refrigerator units.

ON the heels of reports covering potential flat rolled steel demand for postwar uses, some amount of worry is developing over the availability of flat rolled steel in the period of unrestrained production after the war. Belief is being voiced that with the huge automobile output predicted, the increase in refrigerator and other electrical appliance production and the required tonnages for canners and other tin plate users, flat rolled capacity will be overcrowded at some points. New customers using sheet steel in civilian goods production are contacting mills which have previously not shared in their business, evidently with an eye of getting on their books in the period of initial civilian goods output in order to establish themselves as a regular customer. Initial commitments for steel needs after a European victory are appearing. Large automotive steel users are detailing requirements on a week-by-week basis for this period. First steel shipments will begin within a month after V-E Day and will mount steadily thereafter.

New York, Chicago and St. Louis Railroad will take bids Nov. 15 on 4500 all-steel box cars. Central of Georgia is inquiring for 100 to 200 50-ton pulpwood cars. Sorocabana Railway of Brazil has taken bids on 200 36-metric ton all-steel box cars. Northern Pacific has placed, subject to scheduling, 36 lightweight high strength all-steel passenger cars with Pullman-Standard.

Scrap market trends were substantially unchanged this week. Large purchases of railroad heavy melting and better grade industrial scrap took place at Pittsburgh, the material coming from outside districts. THE IRON AGE scrap composite price this week was up 8c. a gross ton to $15.75 a gross ton due to a slight decline at Pittsburgh and a firmness in heavy melting steel price at Philadelphia.

THE steel ingot operating rate dropped half a point this week to 93.5 per cent of rated capacity from last week's revised rate of 94 per cent. Pittsburgh output fell half a point to 93 per cent as did Youngstown, down to 92 per cent. Down two and a half points to 96 per cent are operations in Philadelphia district. In Detroit production decreased two and a half points to 100.5 per cent with the previous week's rate revised upward to 103 per cent, while in Cincinnati output dropped three points to 95. Increased operations occurred in Chicago, up one to 100 per cent; Wheeling, up one to 92; Birmingham, where strikers in the Republic Gulf Steel Works voted to return to work on Sunday, up three to 88, and the Eastern District, up two to 95.5. Cleveland at 99.5; Buffalo at 82 due to a strike at Republic, and St. Louis at 92.5 continued unchanged.

• **BUFFALO STRIKE**—An outlaw strike at Republic Steel Corp.'s Buffalo Plant dropped the ingot rate from 104.5 per cent to 82 per cent of capacity. The dispute involving the year-round employment of an extra worker on coiling crews in the bar mill shut down the plant and made more than 2000 workers idle. Early this week the strikers had refused to resume work. After a five-hour meeting which ended in a vote to stay out. The next general meeting had been set for Nov. 1. A statement issued by the company said that nobody had been dismissed, that the two women involved in the dispute had merely been sent home for failure to obey orders, and that the extra worker assigned to the coiling crew during the hot weather months had been transferred to another job as in past years.

• **MERCHANT STACK ENDS CAREER**—Rich in history among merchant iron producers, the Sharpsville, Pa., blast furnace, formerly owned by the Pittsburgh Coke & Iron Co. produced its last ton of pig iron a few days ago. The blast furnace plant was recently purchased by the Hetz Construction Co., which was unable to find a concern willing to operate the blast furnace. Certain facilities are to be dismantled and re-erected at other locations. Attempts are being made to dispose of various facilities contained in the plant. Like other merchant furnaces which have passed out of the picture in recent years, the cost factor in producing iron became too large a hurdle for continued production.

• **STRUCTURAL BOOKINGS**—September bookings of fabricated structural steel for bridge and building construction reported to the American Institute of Steel Construction by companies representing 76.6 per cent of the total average of the industry during the years 1923-1925, totaled 48,429 tons. This figure compares with 41,322 tons for August, and 61,659 tons for September of last year. The reported September shipments for bridge and building construction totaled 44,871 tons as compared with 51,751 tons reported for the same month last year. The reported tonnage available for future fabrication on September 30 was 151,143 tons.

• **PRICE DISPUTE**—Navy has taken over the first plant involved in a price dispute with the armed forces, The Lord Mfg. Co., of Erie, Pa. The company produces rubber shock mounts for aircraft engines and instruments. They are said to be the only producer of this particular product, and are accused by executive order of having "wilfully failed and refused to furnish" war materials at prices fixed in a joint Army-Navy order of Sept. 23.

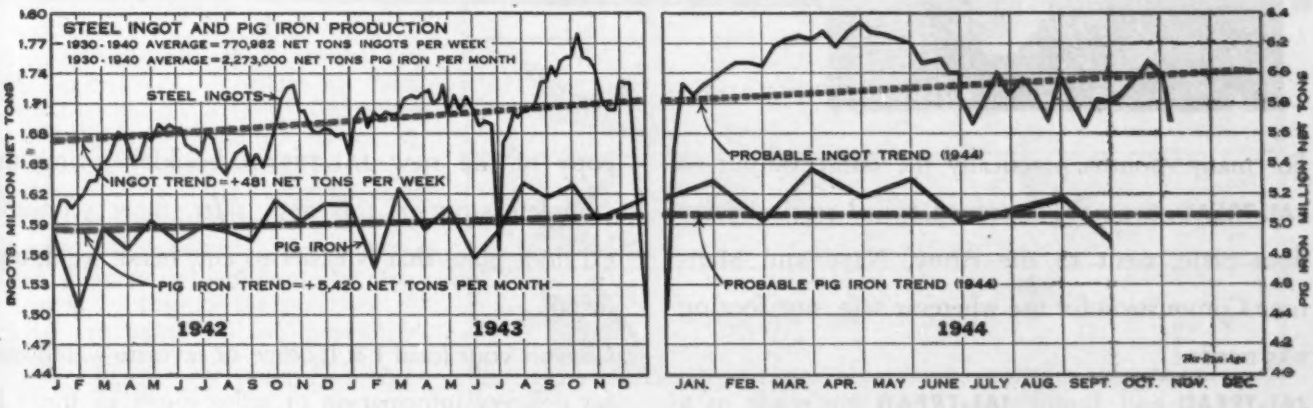
• **BLAST FURNACE RECORD**—Blast furnace "A," Pueblo Works, Colorado Fuel & Iron Corp., blown-in in August after repairs, recently established a new weekly record of 4656 net tons of pig iron. The previous high for the furnace of 4596 net tons was set the week ending May 13, 1944.

• **GM POSTWAR STEEL NEEDS**—General Motors, as has been often reported, will spend $500,000,000 on its reconversion program. Now it has been revealed how much of this money will be used for initial ordering of materials. The day a go-ahead signal is given, GM will activate ordering for 800,000 tons of steel and approximately 125,000 tons of iron. If the past is any criterion, somewhat more than half of the steel buy will be in sheet and strip, with carbon bars the next largest item. Roughly two-thirds of iron requirements will be in gray iron, on the basis of past experience, and the remainder malleable. It is interesting to deduce from this ordering that General Motors does not intend at the start to make any extensive use of aluminum, either for motor blocks or for sheet metal sections.

• **BETHLEHEM OPERATING RATE**—Despite a growing manpower shortage, especially in the common laborer classifications, Bethlehem Steel Co. currently is producing steel at approximately 103 per cent of rated capacity. The average rate for the third quarter of this year was 102.4 per cent, compared with 103 per cent in the second quarter and 101.6 per cent in the third quarter of 1943. Eugene Grace, president of Bethlehem, while stating that current order volume was supporting the ingot operating rate, admitted that there has been a definite softening in steel demand recently and that it has become more difficult to keep the order books full. Average take-home pay for Bethlehem's wage earners was $60.88 a week in the third quarter, $60.87 a week in the second quarter, and $59.52 in the third quarter of 1943. This figure represents the average for all Bethlehem employees on an hourly basis, including steel workers, shipyard employees and others.

• **FREIGHT CAR INQUIRY**—The Chicago-St. Paul-Minneapolis-Omaha Railroad is inquiring for 400 50-ton box cars and 100 50-ton hoppers, and the Santa Fe for 200 auto box cars.

The Iron Age

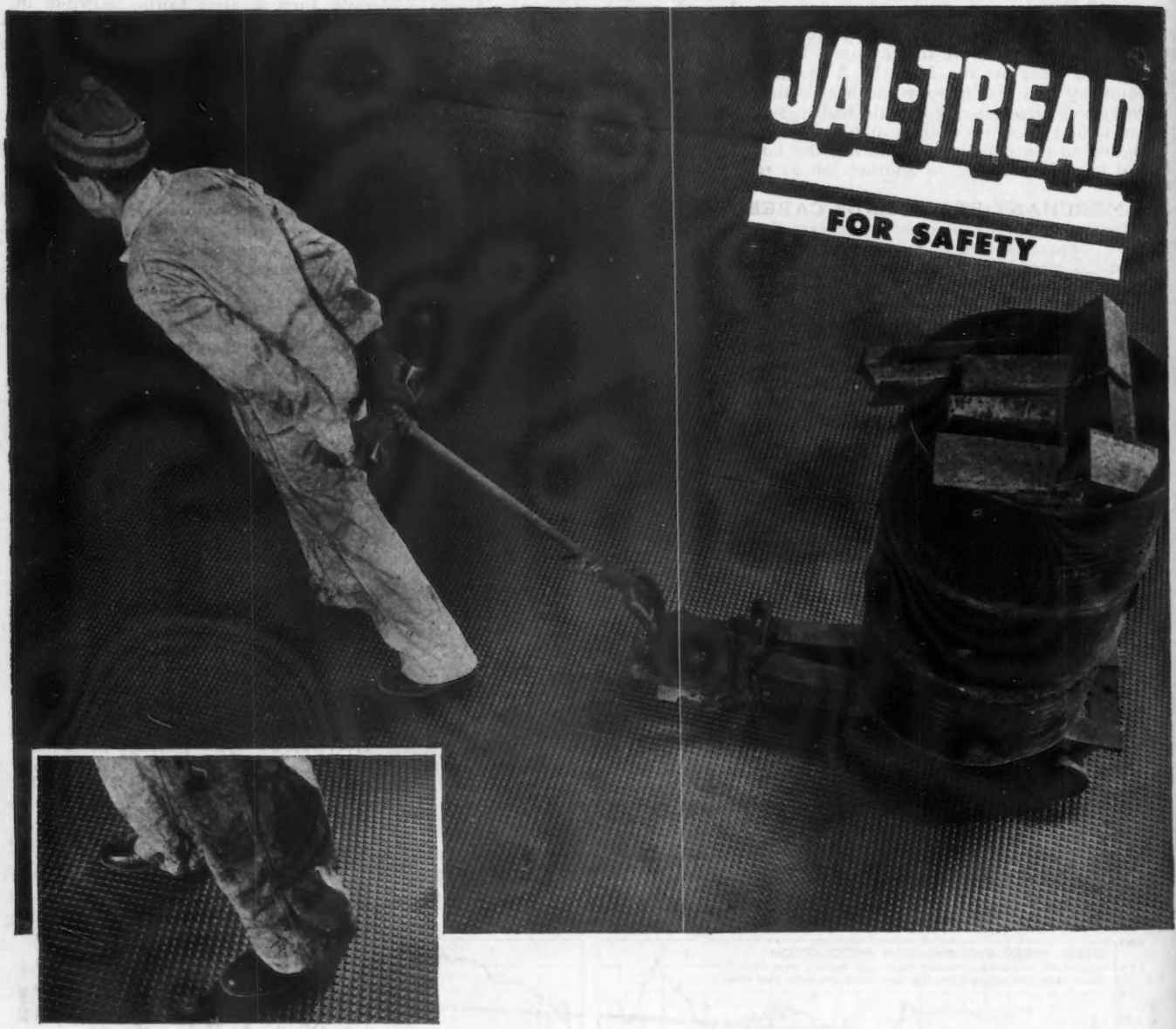

STEEL INGOT AND PIG IRON PRODUCTION
1930-1940 AVERAGE=770,982 NET TONS INGOTS PER WEEK
1930-1940 AVERAGE=2,273,000 NET TONS PIG IRON PER MONTH
STEEL INGOTS
INGOT TREND=+481 NET TONS PER WEEK
PIG IRON
PIG IRON TREND=+5,420 NET TONS PER MONTH
INGOTS, MILLION NET TONS
1942
1943
J F M A M J J A S O N D J F M A M J J A S O N D
PROBABLE INGOT TREND (1944)
PROBABLE PIG IRON TREND (1944)
1944
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
PIG IRON, NET TONS

Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
October 24.....	93.5	99.0	92.5	98.5	99.5	82.0*	91.0	85.0*	103.0*	91.0	98.0	92.5	93.5	94.0*
October 31.....	93.0	100.0	92.0	96.0	99.5	82.0	92.0	88.0	100.5	96.0	95.0	92.5	95.5	93.5

* Revised

THE FIRST CHECKER FLOOR PLATE ACTUALLY MADE WITH "CHECKERS"



For many months practically the entire output of **JAL-TREAD,** the new, improved, rolled steel checker floor plate, went to the Army, Navy and Maritime Commission for use wherever safe, sure footing was needed.

JAL-TREAD and Junior **JAL-TREAD** are made in a wide range of weights and sizes. Send for a copy of the new **JAL-TREAD** booklet giving the complete story of this new, safer, more economical floor plate that is easier to cut, bend, weld, and install.

Consult your local J & L office or favorite warehouse for delivery information or write direct to Jones & Laughlin Steel Corporation, Pittsburgh.

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH, PENNSYLVANIA

CONTROLLED QUALITY STEEL FOR WAR AND PEACE

J&L STEEL

Chicago WPB Director Puts Lid on Spot Authorization Publicity

Chicago

• • • **Because in his** opinion publicity on spot authorizations for civilian production has contributed to civilian apathy towards the war effort, John Nuveen, regional WPB director, has decreed that names or numbers of firms to whom such authorizations are given in this region shall not be made public.

Nuveen points out that the prime requisite to receive civilian goods production authorization through regional WPB offices is a manpower supply sufficiently large so that war production will not suffer. In this region manpower still is scarce, most sections being classified as Class I labor areas, he declares, adding that he expects the situation to get worse before it gets better. Therefore, very few civilian goods authorizations have been made by the regional WPB office here.

In one recent week 33 applications for spot authorizations on form WPB-4000 were received here, of which 31 were denied and two were granted. Of the two granted, one was to a mattress firm having two employees. All of the 31 denials were urged by War Manpower Commission because of manpower stringencies.

Nationally, spot authorizations for civilian production amount to $44,816,000 for the entire fourth quarter, and $152,000,000 for the one-year period commencing Oct. 1, 1944. This compares with estimated production of war goods of $5,450,000 monthly during the fourth quarter, and a war production goal of $5,700,000 monthly. Nuveen asserts that the full amount of civilian production authorized will not be fulfilled because of the ability of rated military orders to push it to one side at any time. About one-third of the spot authorizations have been exceptions to the so-called mattress limitation order, L-49.

The regional WPB office asserts that demand here for war goods is greater than at any time since the beginning of the war and that local production represents a greater proportion of the national total than ever before. Military procurement agencies still are seeking open capacity, it is asserted.

Freight Car Inquiries Seen Lagging

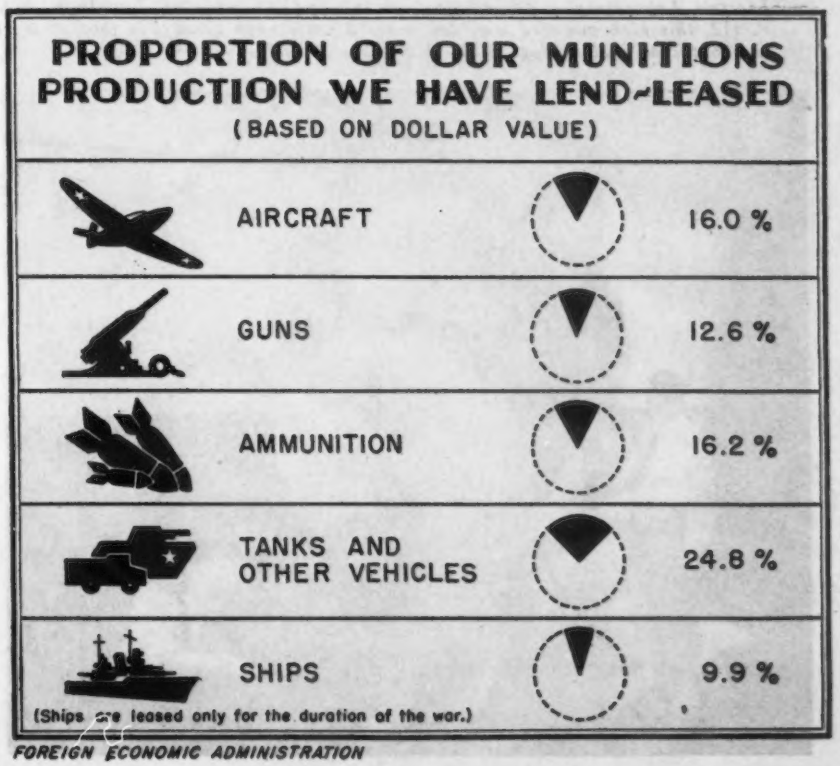
Pittsburgh

• • • **In spite of the easing situation** on steel, there are currently only about 3450 open inquiries for railroad freight cars. The Chicago and Northwestern has inquiries out for 1000 70-ton hopper cars, 100 50-ton hoppers, 400 50-ton box cars, 750 7-ton gondolas, and 250 70-ton ballast cars. The New York, Chicago and St. Louis (Nickel Plate) Railroad has an inquiry out for 500 50-ton all steel box cars, while the Atchison, Topeka and Santa Fe Railroad has inquiries out for 250 50-ton auto box cars. The Central Railroad of Georgia has inquiries out for 100 to 200 50-ton pulpwood cars.

This poses an acute problem for the carbuilders, especially if their war business aside from carbuilding should fall off rapidly. Currently, there are about 32,000 cars for which orders have been placed by domestic railroads, with deliveries scaling downward from about 6250 in November. However, to bolster up car production so that in the last half of 1945 production will be somewhere near capacity, there should be inquiries for at least 28,000 more cars out at present.

The Army car building program likewise is looking a bit on the blue side. The 1945 car program for the Army called for 26,260 cars, but this has been reduced to 10,470 cars, 15,700 of which were suspended and 90 cancelled out entirely.

Considerable interest has been expressed recently in the foreign car purchases and inquiries. The French, asking for something like 74,000 freight cars and 700 locomotives, have not been able to place definite orders for these items. Likewise, South American and Indian interest in car purchases in this country has not reached the buying stage. The Russians are likewise vitally interested in the American railroad car picture. It is believed in some quarters that Russian requirements will be handled through the Army and lend-lease, whereas the car requirements of other countries will have to go through the State Department, the Foreign Economic Administration, UNRRA (labeled by some the WPA of the world), and the Export-Import Bank. In the maze of bickering and shuffling that will come from these agencies, it might be a long time before car shipments actually start to these countries.



FOREIGN ECONOMIC ADMINISTRATION

Abandonment of Farm Equipment Production Quotas Held Not Imminent

Chicago

• • • **Rumors that WPB Order L-257** which sets up quotas for production of farm equipment for the production period ending June 30, 1945, would be revoked, have proved as evanescent as reports that the Little Steel Formula would be broken before election. Both reports are tinged with a political hue, but it is pointed out announcement of revocation of the farm equipment limitation order could be used as a last-minute leaven to raise farm votes without tramping on anybody's toes; whereas a steel wage raise would be bound to antagonize anti-inflationists.

Release of farm implements from rationing long was advocated by the industry before becoming an actuality, but actual timing of the move was conceded to have political implications. Although it has been demonstrated that farmers have adequate equipment to meet agricultural production quotas with bushels to spare, manufacturers do not believe that production of implements will be sufficient to fill customer demand in the 1945 crop year. The highest farm income in history, plus inability of farmers to purchase automobiles and other durable consumer goods, has produced a farm equipment demand the like of which never has been seen before, and probably never will be again.

Ironically, with manufacturers fairly drooling to feed this market, they are still unable to secure components and labor to build even the number of implements permitted them under the WPB quota. This region, the fountainhead of the nation's farm equipment, likewise is one of the tightest labor areas in the country. Manufacturers who let their employees go when implement production was slashed at the beginning of the war, have not yet developed sufficient wiles to lure back a full force. Also the implement builders have run head on into war programs in procurement of such items as castings, chain and galvanized sheets, a condition which threatens to deteriorate rather than improve if automobile production is resumed. Therefore, very little worrying is being done as to whether or not L-257 is tossed as a sop to the farm voters. When they have chewed it up thoroughly, they will find it has not satisfied their appetite any more than a brace of lady fingers in tandem, although it has been extremely indigestible to the manufacturers these past years.

Maury Maverick Is Impressed by Need For Export Trade

Washington

• • • **A stimulation of** international trade under a system of free competition was proposed by Maury Maverick, chairman of the Smaller War Plants Corp., as one means of achieving full employment and full production in the postwar period.

Maverick, just returned from three weeks in Europe, told a press conference that he favored forming selling pools to permit smaller firms to engage in the export business as long as they don't try to fix markets and set prices.

On the domestic front, Maverick suggested that some of the nation's 1139 government-owned war plants be sold or leased to groups of small firms, rather than to single manufacturers.

"Many war plants can become community manufacturing centers locally owned, financed and managed," Maverick said. "At the same time, multiple use will enable the Government to realize a fair price on its investment on many war plants."

In describing his impressions of England, Maverick said, "London has the most courageous people in the world. Housing destruction is almost unbelievable.

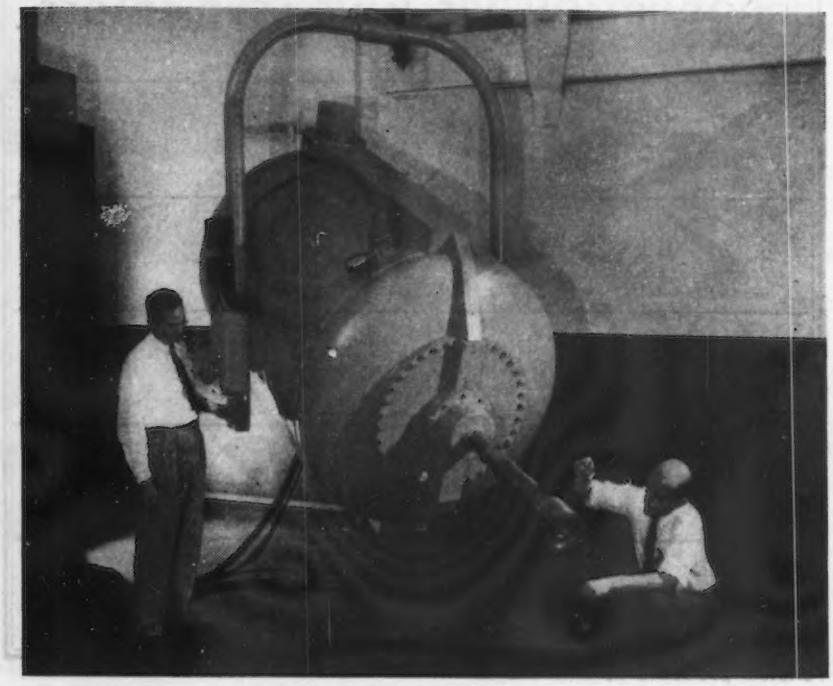
Rebuilding these homes, plus the probable 40 million needed on the continent, will provide an almost unlimited market for American building materials and hardware, Maverick said.

To enable Britain to re-enter the world market, complete retooling of her war machine will be necessary, according to Maverick, along with what he described as a "greatly expanded technical education."

One of the foremost advocates of postwar planning before the three-week trip to Europe, Maverick said that he still recognizes the need for planning, but that people should realize that the war is still on, and is not yet won.

American mass production has given this country enormous competitive advantages in the world market, and we are ahead of England in reconversion planning, according to Maverick.

2,000,000 VOLTER: *Dr. Ernest E. Charlton, left, and William F. Westendorp checking the new* **2,000,000** *volt X-ray unit developed by them in the General Electric Laboratory. As indicated in the Oct.* 19 *issue of* THE IRON AGE, *P.* 112, *this high powered unit can make a radiograph through a foot of steel in about 2 hr. and through* 8 *in. of steel in* 3½ *min.*



Jessop Steel Discusses Possible Acquisition of DPC Leased Equipment

Chicago

• • • **Possible acquisition** by Jessop Steel Co., Washington, Pa., of properties now leased from Defense Plant Corp. is discussed in a registration statement filed with the Securities and Exchange Commission in respect to $1 million of first mortgage 5 per cent sinking fund bonds, due 1954. Underwriters are Paul H. Davis & Co. and Dempsey & Co., Chicago.

The statement mentions net proceeds of the issue would be available for "general corporate purposes pending specific allocation of such funds, including, but not by way of limitation, the maintenance of cash balances, the carrying of inventories, accounts receivable and other current items, the financing of plant improvements and additional plant facilities and the possible acquisition of the properties now leased by the company from the Defense Plant Corp." No specific allocations of the funds has been made for any of these purposes, the statement continues, and the actual use of the fund will depend upon circumstances as they may arise in the future.

Approximately 25 per cent of the structure housing the company's electric furnace department comprises a DPC addition made in 1942 and two of its 10-ton electric furnaces and its 1-ton induction furnace are leased from DPC. DPC also owns certain cranes and auxiliary equipment. Approximately one-third of the total area of the sheet and plate mill is leased from DPC, having been added in 1942. An L-shaped wing, added by DPC, which presently houses the final inspection and shipping department for armor plate, the company expects to utilize for stainless steel operation. Approximately one-quarter of the total area of the bar mill department is leased from DPC, as is an 18-in. rolling mill, and several cranes and furnaces. Substantially all of the centerless grinding and cold drawing department, the pickling and sandblasting department, the heat treating and tool bit department and the grinding department are leased from DPC, including the structures in which they are housed.

Except for centerless ground and cold drawn bars and other cold drawn shapes, it is believed that the company could produce substantially all of the products it now makes without DPC facilities, but its annual capacity would be reduced approximately 40 per cent from the present total utilizing DPC facilities. However, it is believed that the company would not have sufficient melting capacity, rolling capacity, or auxiliary equipment to take care of either its current requirements or anticipated postwar requirements without the DPC facilities.

The total cost of the facilities leased to the company by DPC was $1,571,506, of which approximately $400,000 was attributed to plant improvements and the balance to new equipment. The lease expires Jan. 1, 1947, but is extendable to Jan. 1, 1949. Rental provided in the lease subsequent to July 1, 1943, is $2.52 for each net ton of electric steel ingots produced through the use of both company owned and DPC electric furnaces located at the existing plant. On this basis the company has paid an aggregate of $175,520 through Aug. 31, 1944.

Transport Items And Ordnance Fall Behind

Pittsburgh

• • • **Serious shortages** of artillery ammunition, bombs, and transport items are developing in this area as a result of increasing requirements of the Armed Services, according to C. C. Morrison, district manager of the WPB. Tires, medium tanks, general purpose and fragmentation bombs, heavy trucks, transport and combat loaders, and military dry batteries, are among the short materials.

Shortages of manpower and the lack of some manufacturing facilities in some instances are impeding production, Mr. Morrison pointed out. However, he warned against over-optimism and letdowns on the part of the workers in the district's war plants.

He said that V-day will be the day when all war programs that are now lagging are brought up to schedule and weapons have been delivered to the fighting fronts.

Commenting on "spot authorizations," he said that some have been granted, but only where manpower, materials, and machinery not otherwise usable in the war effort are available, and if war necessity warrants, these "spot authorizations" may be rescinded.

JAPANESE MATERIEL: *On display somewhere in China is a representative collection of Japanese small arms, including rifles, machine guns, and the often discussed "knee mortar."*

Subcontractor Information On ASF V-Day Cutbacks Is Lacking

Washington

• • • **Thousands of subcontractors** have been left in the dark by the Army Service Forces with respect to information on the extent of V-Day cutbacks.

All price contractors, on the other hand were notified practically 100 per cent as of Sept. 30. The Ordnance Department had interviewed artillery manufacturers, 100 per cent; automotive ordnance, 98 per cent; small ammunition makers, 100 per cent; other ammunition producers, 95 per cent. The Army Air Forces have notified all aircraft companies, and the same is true of the Signal Corps in the case of radio and radar makers.

Within the past two weeks, the ASF has notified all chiefs of technical services to inform all prime contractors that they should notify subcontractors as soon as possible.

This is all, ASF believes, it can be reasonably expected to do, in view of the fact that it has no information on the hundreds of thousands of subcontractors. But, from the beginning, ASF never tried to find out about the position of great numbers of these manufacturers, and consequently has no information now.

It is reported that ASF went to WPB for information on subcontractors, but since WPB has not done the procurement, there was no way for it to make the information available.

A study on the effect of cutbacks, made by the WPB Statistical Division, which showed the regional impact of cutbacks on prime contractors was killed because it did not take into consideration the subcontractors. WPB Chairman J. A. Krug once said that a substitute study would be made, but now it is understood that the information is simply not available. There will be no new study.

Trade sources say the effect of this policy is to leave most subcontractors in a quandary without any basis to plan on what to do about civilian production after X-Day.

Brazilian Schedule Calls for 300,000 Tons Steel in 1945

New York

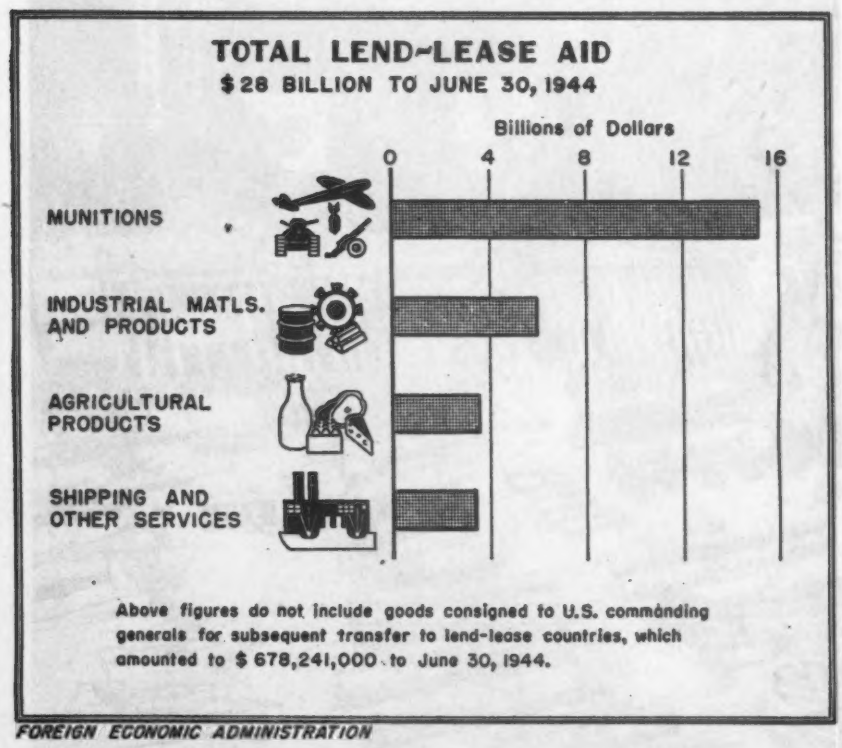
• • • **The new Brazilian** steel mill at Volta Redonda has a production schedule for 300,000 tons for next year, according to Prof. Arthur Phillips of Yale University, who has recently returned from a lectureship assignment in the country. Prof. Phillips spoke with Dr. A. Allan Bates of Westinghouse Electric and Mfg. Co., and Dr. Robert F. Mehl, of Carnegie Institute, who accompanied him on the assignment, at a recent pre-commencement dinner honoring Stevens Institute graduates. The South American trip, sponsored jointly by Stevens and the Office of the Coordinator of Inter-American Affairs, consisted of lectures on metallurgy delivered to students and industrialists.

According to Prof. Phillips, who lectured on non-ferrous metallurgy, the new mill in Brazil is modern and well equipped. Tinplate will be produced, but no tool or alloy steel. In addition to the steel plant, Brazil has a pig aluminum plant, and a copper alloy plant, with both modern and obsolete equipment in use in close proximity. These plants lack men technically and scientifically trained for their operation, he continued.

Brazil is a source for some of the unusual minerals required by many of the technological developments fostered by the war, but most of them are as yet undeveloped, Prof. Phillips said. Expansion of transport power and communications will make them more accessible and aid in their development.

Dr. Mehl said that an attempt is being made by Brazil to convert in a short time from an agricultural nation into an industrial one. In a few fields, such as reinforced concrete construction, Brazil is out in front, but the country needs more shirt-sleeve engineering than desk engineering. A metallurgist there may be forced by circumstance to design and build his plant, specify and install equipment, and then install metallurgical practice. As a contrast, in this country engineers can receive their practical training in industry after leaving school. Brazil's industries are not sufficiently modern to permit that.

Dr. Bates, who lectured on iron and steel in Brazil, described the transitional period through which the South American countries are passing, using a dictatorship to prepare themselves for true democracy. He pointed out that our assistance today in the industrialization of Brazil will promote increased trade in later years.


TOTAL LEND-LEASE AID
$28 BILLION TO JUNE 30, 1944
Billions of Dollars
0
4
8
12
16
MUNITIONS
INDUSTRIAL MATLS. AND PRODUCTS
AGRICULTURAL PRODUCTS
SHIPPING AND OTHER SERVICES
Above figures do not include goods consigned to U.S. commanding generals for subsequent transfer to lend-lease countries, which amounted to $ 678,241,000 to June 30, 1944.

FOREIGN ECONOMIC ADMINISTRATION

OWM State Director Favors Surplus Property Clearing Houses

Chicago

• • • Speedy disposal of surplus war property would be facilitated by establishment of clearing houses in each state, Lt. Col. E. C. Kavanagh, director of the state and local division, of the Office of War Mobilization, declared here recently.

Cities, counties and other political subdivisions could list their needs for items of surplus consumer goods at these central points, where they would be checked against lists of war properties that become available, he pointed out in speaking before a meeting sponsored by the Illinois Commission of Intergovernmental Cooperation and the Council of State Governments. Because of the wide fluctuations from day to day, it would not be possible to catalog the items on hand, he declared, thus making it more practical for buyers to list their requirements.

Estimates of surplus war goods running to $100 billion are misleading he said, but as much as $90 billion of these may be in the Far East, France, and other theatres of war, from which they never will be returned.

Surplus consumer goods currently are being distributed on the basis of need, it was stated. For example, trucks originally scheduled for sale in Maryland and Delaware were sent to Virginia to help save the peach crop. Thirty thousand more trucks will be made available in the near future, Lt. Col. Kavanagh said. At the time of his speech, the Treasury Department had already disposed of 28,500 trucks, 7000 motorcycles, and 4000 passenger cars.

Newest Light Tank Bears 75 MM. Cannon On Widest Trackage

Milwaukee

• • • A new light tank with automatic drive through eight speeds forward and four reverse, mounting a 75 mm cannon, has now been lifted from the Army's restricted list. The armor plate body has been in production for months by The Heil Co., Milwaukee.

The new weapon has fire power equal to that of a medium tank, speeds over 40 miles an hour, and includes many features requested by men in the battle lines. Designated the M-24 it supersedes the famous M-5, or "Honey."

The M-5 has been replaced by the new M-24 on the basis of recommendations from Army officers and engineers who as "technical observers" spent months on Mediterranean and European fronts in actual battles. To these suggestions were added the best features gleaned from a study of captured enemy tanks and British and Russian combat weapons.

Among the features of the new M-24 are: (1) 75 mm cannon replacing a 37 mm on the M-5. (2) Lower silhouette, an over-all height of less than 87 inches and a hull height of less than five feet. (3) For protective advantages all important armored surfaces including the turret are sloped up to 45 degrees. (4) Greatly reduced ground pressure in conjunction with new track and suspension for negotiating marshy terrain. (5) Greater maneuverability and doubled obstacle climbing ability even at the expense of some speed.

The "power train" of the M-24 consists of two Cadillac V-type, 8-cylinder engines basically identical with those used in peacetime automobiles, and two Hydra-Matic transmissions operating through a power transfer unit. The newly designed automatic drive provides eight forward speeds, with a manual control between the upper and lower ranges and four speeds in reverse, automatically selected.

Automatic gear operation in reverse is a new development for the M-24. According to Army men this enables the M-24 to rush up to the crest of a ridge, fire at an enemy objective, back immediately away, reload and zig-zag up to a new firing position so that enemy artillery trained on the original firing position cannot knock the tank out of its reappearance.

Maneuverability of this new 20 ton weapon, which has been made one foot wider than the heavier medium tank, is further improved by very wide trackage and reduced ground pressure now lower than the tread of a man of average weight. Tests at Army proving grounds show that it can climb up anything it can cling to, which means inclines up to 60 per cent, and that it can surmount a vertical obstacle 36 in. high with ease. Ordnance officials say that this soft "footing" ideally adapts the M-24 to the marshy areas of the current Pacific theater of war and to the off-summer seasonal conditions generally prevalent in Europe. Suggestive of the side sweeps being made by Gen. Patton's command in France, the M-24 will operate well over 100 miles without refueling.

In addition to its 75 mm new high velocity cannon, it carries a 50 cal. anti-aircraft gun, smoke mortar, 30 cal. coaxial gun and a 30 cal. bow machine gun swivelled to spray over a wide frontal arc. It carries additionally, sub-machine guns for each crew member as well as a supply of grenades.

o o o

ONE POINT LANDING: *Navy Blimp, part of the important coastal patrol program makes contact with the deck of one of our aircraft carriers. The deck crew of the carrier handles the blimp guy lines.*

o o o

Canadian Steel Ordering Spurs Hope for Shift to Civilian Output

Toronto

• • • **Recent order placing** in the Canadian steel markets indicate that industry in this country has hopes of an early swing to civilian production activities. Ontario steel mills now are almost solidly booked to the end of this year, the only surplus capacity being in plate, with minor tonnage available for late December shipment. On bars and sheets delivery against new orders is set at February and March respectively.

Approximately half of current backlogs and new order placements are associated with production of consumer goods. There has been steady slowing in operations at shipbuilding yards and some other war plants, although output of heavy artillery shells is being maintained at capacity.

Rolling stock builders, both car and locomotive, are maintaining capacity production and report backlogs extending through first half of 1945, and these consumers have been extensive buyers of plate, sheets, bars and other materials over the past few weeks.

Agricultural implement industry has swung almost entirely from war to peace time production, and reports big orders on hand for domestic use and export. Implement makers are the largest steel buyers at this time.

Further indications of early return to peacetime manufacturing are reports from government heads which are lifting bans on production and sale of various consumer goods. It is stated that raw materials for this use will be made available, but the labor situation remains critical and there is doubt that sufficient workers can be obtained before the end of the year, at the earliest. Retooling also will be necessary in many plants before large scale output of civilian goods can be attained.

Announcement was made by H. H. Bloom, administrator of farm and construction machinery and municipal service equipment, in the Wartime Prices & Trade Board, that 27 types of new construction machinery and equipment now may be sold without restriction. The relaxation accompanies extensive revision of the Board's controls over new construction and included permission to manufacture a few types of equipment formerly not allowed.

The list which may be sold without restriction includes bulldozers for mounting on tractors, 25 draw-bar hp. or less, blade ditchers, snow plows for mounting on tractors of 25 hp. or less, pile hammers and certain types of hoists. The board said relaxation of the controls has been made possible by a falling off in demand for construction machinery because of completion of many wartime construction projects and better supplies of metals. Manufacturers are still required to obtain the administrator's approval.

While restrictions on the use of aluminum are to be removed by order of the Department of Munitions and Supply, it is not likely aluminum foil will be available for civilian use.

At present, all available aluminum foil capacity in Canada is tied up with United Kingdom contracts for supplying the anti-radar streamers used extensively in modern aerial warfare. Until they are cancelled or expire there will be no available capacity for manufacturing aluminum foil in Canada.

One important step taken recently by Department of Munitions & Supply officials was the release of a considerable quantity of aluminum sheet for manufacture of spun and drawn aluminum kitchen utensils. It is expected that the new utensils will be available for consumers by Christmas. Actually a program for manufacture of utensils was drawn up last February but lack of manpower and fabricating capacity is given as the reason there has been no production.

Regional WLB Acts On Classifications, Wages and Vacations

Chicago

• • • **A proposal that** 1500 employees of 28 Chicago shops be given a 5c. an hr. general wage increase, included in a master contract between the Iron League of Chicago and the International Association of Bridge, Structural and Ornamental Iron Works, Local 473, has been turned down by the Sixth Regional War Labor Board.

Other wage adjustments were approved, retroactive to May 1, 1944. Contract minimums, which are the same as in the previous contract, were approved. Proposed increases in wage ranges for various job classifications were approved with modifications. Labor members of the board dissented on the denial of the general increase and modification of the proposed rate ranges.

Maintenance of union membership, with a 15-day escape period for employees wishing to resign, has been ordered by the board at three Milwaukee plants.

Industry members of the board dissented in the decision which involves 252 workers at the Metal Forms Corp., A. F. Wagner Iron Works, and Worden-Allen Co. The union involved is the International Association of Bridge, Structural and Ornamental Iron Workers, local 471, AFL.

Approval was given to agreement between the company and union at Wagner Iron Works on job classification and rate ranges, with the wage agreement to become effective on the date of the board's order instead of with a retroactive provision asked by the union. Worden-Allen Co. was ordered to give a 5c. an hr. general wage increase to all employees, retroactive to Nov. 1, 1943. A flat starting rate of 65c. an hr. was ordered.

Night shift premium and a vacation plan jointly requested by P. R. Mallory & Co., Inc., and local 1001, United Electrical Radio and Machine Workers of America, affecting 4500 workers, has been partially approved.

The board approved a premium of 10c. an hr. for the second shift and approved the company-union agreement on call-in pay, idle time and testing new operations. Under the approved vacation plan, employees who have been employed by the company five years by June 30, 1945, or as of June 30 of any subsequent year during the contract period, and who have worked more than six months during the preceding year, shall receive two weeks vacation with pay. This is to be computed at 4 per cent of earnings, exclusive of overtime and nightshift premium, for the previous calendar year, or at 80 hr. straight time hourly rate as of Dec. 31, whichever of the two methods is higher. Employees with one year's service under the same qualifying dates who have worked six months of the previous year will receive one week's vacation with pay computed at 2 per cent of earnings or 40 hr., which ever is higher.

Krug Makes New Taxpaying Arrangements for Necessary Facilities

Washington

• • • WPB Chairman J. A. Krug recently announced measures to implement Executive Orders 9490 and 9491 signed Oct. 20, affecting war facilities financed under Sec. 124 of the Internal Revenue Code, which allows taxpayers to write off the cost of necessary facilities over a five-year period or less should the emergency end sooner. The new executive orders authorize WPB to amend "necessity certificates" originally issued by the Army and Navy and to issue so-called "payment certificates."

Amendments to necessity certificates merely correct descriptions of facilities and set forth their actual cost in cases where the original certificates were issued on an estimated basis.

The payment certificate is authorized where a payment has been made by the Government for the unamortized cost of an emergency facility because a contract has been terminated. The effect of these certificates is to make such payments tax-free.

Under provisions of Section 124 of the Revenue Code, a taxpayer may be entitled to a so-called "non-necessity certificate," under which, at his election, his rights may be substantially affected. In order to coordinate administrative policy, the responsibility for issuing non-necessity certificates was centralized in WPB some time ago by an executive order signed by the President last Sept. 30.

Following issuance of the two latest executive orders Chairman Krug said that the WPB Tax Amortization Branch has been transferred to the Procurement Policy Division. Tax amortization, formerly a part of the Facilities Bureau, is headed by Robert A. Irwin of New York, who will become deputy director of the Procurement Policy Division.

In announcing the organizational change, Mr. Krug explained that it was made in order to coordinate policies with respect to tax amortization, renegotiation, termination, requisitioning and general procurement in one division directly responsible to the chairman.

Westinghouse Sets Up Unique Sales Method For Surplus Material

Pittsburgh

• • • The traveling salesman is back on the road again, selling surplus war materials. His line of goods is as diversified as it is unusual—machine tools and typewriters, raw materials and intricate regulators and hundreds of other items which the vagaries of a wartime economy have placed in his employer's hands.

The Westinghouse Electric & Mfg. Co. announced recently that a corps of salesmen, with lists of materials declared surplus because of changes or curtailment of war contracts and lists of prices of these items, is now calling on other manufacturers and jobbers throughout the country.

Disposition of the materials no longer needed by the Army, Navy or Maritime Commission and which would not be adaptable to peacetime pursuits of the company is being handled under direction of a Surplus Property Committee composed of three senior officers. Its members are Andrew H. Phelps, vice-president in charge of purchases and traffic; Gwilym A. Price, vice-president, whose duties include settlement of war contracts; and E. L. Spray, assistant to the president in charge of the Headquarters Manufacturing Division, Pittsburgh.

In this manner it is believed that the company will be able to clear factory floors and warehouses of materials no longer needed for their wartime manufacturing contracts, and which are not ordinarily used in peacetime manufacture. This does not signify any let-up in the wartime production, it was pointed out by Mr. Phelps, but it will pave the way for changeover at such time as the government feels that consumer goods again can be produced. In addition, it speeds to those industries that still need them certain materials no longer needed by Westinghouse because of contract cancellation or curtailment.

In the intricate process of disposing of materials declared to be surplus, manufacturers work under the close supervision of Army, Navy or Maritime Commission contracting officers. Once materials are declared to be surplus, three definite steps may be taken: 1—Army, Navy and Maritime Commission circularize their own sources to determine if the goods can be used elsewhere. 2—If they exhaust their sources, they then give the company holding the materials a period (usually 60 days) in which to dispose of them. During this period the company may make its own bid for the materials, and, if accepted, the goods may then be used or disposed of at will. At the end of the 60-day period the war contract claim against the government is negotiated and settled. 3—If the surplus materials cannot be sold elsewhere and the company does not want them, they may be declared scrap. Once declared scrap, the goods must be sold as such.

U. S. Navy Takes Over Lord Manufacturing Co. in Price Dispute

Erie, Pa.

• • • The United States Navy has recently taken over management of the Lord Manufacturing Co., local firm engaged in the production of rubber shock absorbers for aircraft engines and instruments.

Rear Admiral H. B. Bowan and a staff of seven men moved into the plant after issuance of an executive order signed by President Roosevelt as a result of a price dispute, the first of its kind in the history of this war. The order stated that the Lord Co. had "wilfully refused and failed to furnish" war materials at prices fixed in a joint Army-Navy order of September 23.

The order continued, "The company's conduct has interfered with the production and supply of aircraft parts and other essential war materials." It directed the Secretary of the Navy to operate the plant "in such a manner as he deems necessary for the successful prosecution of the war."

The President's order said that the Lord Co. had changed the terms and conditions of sale in such a way that "the return to the company was increased above prices fixed in the Army-Navy order."

The company vice president, Thomas Lord, conferred here with other company officials and was expected to meet later with Admiral Bowan. The Navy officer has asked company employees to remain at their posts, and do everything possible to accelerate war production.

WPB Official Sees Labor and Industry V-Day Evaporation

New York

• • • The munitions program will see a 20 to 25 billion dollar a year cutback after V-day, according to statements made by S. W. Anderson, vice-chairman of the WPB before the Marketing Conference of the New York chamber of commerce, held recently at the Waldorf-Astoria Hotel.

The reductions will not be uniform, nor will the cuts come all at once, Mr. Anderson stated. "They will be primarily from the Army ground forces and air forces," he pointed out, "and the impact of these cancellations, down through subcontractors and the pipeline of suppliers and of materials and components will be widespread. Several million war jobs will disappear.

"The impact of the cut on the available supplies of materials and components will also be quite uneven and it, too, is hard to measure accurately. In some fields the case is clear. There will undoubtedly be ample capacity to produce steel, aluminum, magnesium, zinc, synthetic rubber, machine tools, most bearings, gasoline engines, radio equipment, and many others. In some other fields, the case is less clear.

"In the field of materials and components it is important to keep in mind that the expansion of American industry in the last three years has been chiefly, although not exclusively, in the realm of heavy metal goods production. Many of these facilities are not adapted to peacetime production. The predicted cut of $25,000,000,000, therefore, is not a good yardstick for measuring accurately the elbow room which will develop in materials and and components after victory in Europe. The armor plate mills, some of the aluminum plants, many of the heavy equipment facilities are not designed or intended to produce the lighter caliber of products which civilians buy. Thus there will be 'facility evaporation,' if I may coin a term, as well as labor evaporation.

"The War Production Board is endeavoring to assist the services in deciding the cuts to make in order to free, for civilian production, those facilities which will most likely be needed in resuming private civilian production. This is not always possible, of course, but, where there is a choice and where the facts are susceptible of reasonable examination, we want to see that the private plants are relieved of war work where such relief is, in fact, desired by the manufacturers themselves.

"In spite of these two forms of 'evaporation' after Europe, a great many companies will soon find themselves in a position to undertake non-war work, and the workers and facilities to carry out this work will be at hand. Now as we in the War Production Board see it, our job in government is to stand aside as rapidly as we can, to permit business to resume production of civilian articles as fast as it is prepared to do so.

"There are on the books today approximately 500 orders limiting or controlling production of various products and materials in one way or another," Mr. Anderson continued. "A careful examination has been made of all of these orders in an attempt to determine as accurately as we can which of them will no longer be needed after V-E Day. We have imposed strict criteria upon ourselves in making this examination.

"Unless it is clear that the revocation of an order would create a situation which would be likely to damage the continuing large war effort, it is listed for revocation. This principle is difficult to apply as you can well imagine. A case or two may illustrate the problem. Let us take two extremes—aluminum and tin. There will be enough aluminum in all forms (and, in fact, there is now) for our Japanese war program and, for that matter, for all forms of near term civilian needs visualized even by the most optimistic. Thus all controls on aluminum will be promptly revoked. Most of them have already been revoked. At the other extreme, under any kind of calculation, we will be short of tin until the Far East is reconquered and re-equipped—so short, in fact, that it is clear we must retain most of our tin controls for some time in order to see that the true war needs are met."

About 350 control orders of the 500-odd orders now on the books are scheduled for revocation according to Mr. Anderson. Those to be retained are heavily concentrated in the fields where it is certain that continuing shortages will require the continuation of close allocation or other types of control. They are principally in the textile and leather fields, the forest product field, the container field, and the chemical field—a total of about 100 out of the 150 to be retained, he concluded.

Large Galvanized And Painted Sheet Inquiries Are Out

Pittsburgh

• • • Two large inquiries for sheets have been sent out, one involving about 7700 tons of galvanized corrugated sheets for Navy barracks buildings abroad and 5000 tons of cold rolled, corrugated and painted sheets, for which the destination and disposition is not very clear.

The Navy Bureau of Yards and Docks inquiry, which calls for 7700 tons of 24 and 26 gage corrugated galvanized sheets plus something close to 25,000 tons of structural steel is for 500 two story barracks type buildings with floor dimensions of about 160 x 50 ft. These will be painted on the outside with camouflage paint, either by fabricator or on the field. Bids are out to about 40 fabricators for the construction of these units.

The 5000 tons inquiry is for 28 gage cold rolled sheets, 28 in. wide with 2.5 in. corrugations, in stock lengths, presumably about 6 ft. The inquiry did not come through any government agency directly, but it is believed that this material will be used for the construction of government surplus materials warehouses. These sheets are not to be galvanized, but will be painted at the time of fabrication. While some mills are equipped to paint such sheets, this inquiry does not specify such a procedure. Deliveries are to be made on a 500 ton a month schedule beginning in January.

Cold rolled sheets as far as the supply situation is concerned are in a good position, with some mills showing openings in December. However, the manpower situation at the cold rolling mills is pretty bad, with some mills indicating that material has been piling up in the cold mills awaiting processing.

J. & L. Net Income

Pittsburgh

• • • Jones & Laughlin Steel Corp. reports for the quarter ended Sept. 30, 1944, a consolidated net income of $1,889,847. This compares with a net income of $2,249,964 for the same quarter in 1943. Consolidated net income for the nine months ended Sept. 30, 1944, was $5,478,034, compared with $7,060,581 for the same period in 1943.

Treasury Surplus Offices to Publish Sales Information

Washington

• • • Each of the 11 regional offices of the Treasury Office of Surplus Property will soon issue a publication called the Surplus Reporter, it was announced on Oct. 28 by Russell C. Duncan, Deputy in Charge of Sales and Merchandising.

The Reporter will advise firms what is being offered, where it is located, and the method which will be used to sell it.

If sale is to be made by invitation to bid, forms will be sent. If sale will be made by fixed price, negotiation or otherwise, the prospective purchaser will be advised.

The new system which is aimed at coordinating surplus information on a national basis makes it no longer necessary to automatically send invitations to bid. In the future, those interested will request invitations on items wanted, Treasury said.

The plan will eventually cover all eight divisions of the Office of Surplus Property consisting of the following: Furniture, Hardware, Machinery, Automotive, Textiles and Wearing Apparel, Medical and Surgical, Paper and Office Supplies, and General Products.

Mr. Duncan said that the Washington office will act as a policy, pricing, and directorial staff, and as it is organized on a commodity basis, each of the 11 regional offices are being set up in conformity.

Buffalo Strike Causes Sharp Ingot Rate Drop

Buffalo

• • • An "outlaw" strike, involving a dispute over the year-around employment of an extra worker on coiling crews in the bar mill, last week shut down the Buffalo plant of the Republic Steel Corp. More than 2000 workers are affected, according to a company spokesman.

Despite appeals of leaders of the CIO-United Steelworkers, who declared the stoppage was "unauthorized," together with efforts of representatives of the U. S. Conciliation Service, the Navy and Army Ordnance, the strikers have refused to resume work. On Sunday, a five-hour meeting of the strikers ended in a vote to stay out and the next general meeting was set for Nov. 1.

The walkout started early on the morning Oct. 24, as the direct result of an argument between two women coilers and their foreman. By midnight, all operations had been halted except for one blast furnace, which was producing foundry iron. Eight open hearths were shut down and one blast furnace, on basic iron, was banked. The strike slashed the district ingot rate from 104.5 to 82.0 per cent of capacity.

A statement issued by the company said that nobody had been dismissed, that the two women involved in the dispute had merely been sent home for failure to obey orders, and that the extra worker assigned to the coiling crew during the hot weather months had been transferred to another job as in past years.

Foundry Group to Hold Next War Production Congress at Detroit

Chicago

• • • Announcement has been made by the American Foundrymen's Association that the 1945 Foundry Congress, the 49th annual meeting of the association, will be held in Detroit the week of April 30-May 4. The event is announced as the 4th War Production Foundry Congress and the program is being planned to stress the necessity of continued high production by the Foundry Industry even though "V-E Day" may precede the event itself.

It is expected that a number of important technical papers will be presented at the meeting by outstanding metallurgists and operating men of the automotive industries centering in the Detroit area. Many important developments in foundry practice have been made in connection with the tremendous war production efforts of the auto manufacturers.

Each branch of the castings industry will be represented in the technical program, with major emphasis placed on non-destructive testing methods, sand practice, melting operations and other phases of foundry work of greatest value to wartime industry. A feature will be the presentation of the third A.F.A. foundation lecture, to be presented by Dr. H. A. Schwartz, manager of research, National Malleable & Steel Castings Co., Cleveland, on "Solidification of Cast Metals." Dr. Schwartz is internationally known for his basic research in metallurgical fields and the fundamental nature of his lecture should have universal appeal.

Carloading Picture Shows Lack of New Car Replacements

Pittsburgh

• • • With carloadings extremely heavy and new railroad cars scarcely making replacements, there are spots in the transportation picture that are causing the railroads as well as the shippers considerable concern. So far, railroads have been getting by, but if a severe winter should be accompanied by a heavy demand for railroad shipping facilities, serious disruptions of service are possible.

During the past year, the tank car situation has eased somewhat, and presently is not too bad. The one main problem is the grain movement from the West, where elevators are blocked and there is grain on the ground. In this area, there is an occasional tight coal car situation, and heavy month end loadings at the various steel plants here cause jam-ups.

The manufacture of cars for the army overseas, plus the fact that domestic railroads have had difficulty in getting the steel required for car replacement, have brought the number of new cars coming into service barely to the point of car replacement.

Under the setup of WPB Advisory Boards, there are some 900 Car Efficiency Committees. These committees have been policing the unloading of cars all over the country, in an attempt to keep the cars moving as efficiently and rapidly as possible. This service has been extremely valuable, and railroads readily admit that without it there would have been some very critical situations.

Federal Rolls Cut To 2,880,997 Jobs

Washington

• • • September figures on total U. S. Government employees showed a decrease of 60,212 since Aug. 1, according to the Civil Service Commission. The total for the end of September was 2,880,997.

The reduction in Washington in September was 5477, to a total of 259,058, lowest in almost two and a half years.

Of the total, War Department was the highest with 1,200,063; Navy Department, 65,996, and emergency agencies, 170,018. War agencies accounted for a total of 2,036,077 of all executive branch employees.

Roosevelt May Create New Export Planning Cabinet Office

Washington

• • • **A new cabinet office** may be created by President Roosevelt shortly after the election and the President may ask Congress to transfer to the new department some of the functions of a half a dozen existing departments, bureaus and agencies operating in the field of foreign trade.

Mentioned in the highest administration circles with the greatest secrecy, the new cabinet post which is as yet unfilled would assume the duty of increasing United States exports by furnishing technical knowledge in bringing together the foreign and domestic buyer and seller.

The new federal commerce agency, it is understood, would in some cases supersede the authority of the State and Commerce Departments, the Foreign Economic Administration, the Federal Trade and Tariff Commissions and the office of the coordinator of inter-American affairs. In other cases, its representatives would act in an advisory capacity, furnishing the business viewpoint to this country's emissaries.

The new agency will assist the Department of Justice in fighting the old European cartels in finding markets for United States goods. Yet it is said that the plan has the general approval of the United Kingdom and continental countries whose industries before the war were largely cartelized.

Foreign trade officials also say that Russia and China and most of the American republics favor the destruction of the old line cartels. This will be done as soon as Germany is defeated. Speculation is rife on the question of who will get the new cabinet job if it is created. The names of Undersecretary of State Edward R. Stettinius, Director of FEA, Leo Crowley, presidential aide Harry Hopkins, Donald M. Nelson, former WPB chairman and COIA head, Nelson Rockefeller. No one seems to be willing to say who has the nod.

Representatives of the Federal Commerce Department will be sent to all trade centers of the world where they will act as intermediaries between private companies and foreign governments.

Former President Hoover established the office of Commercial Attache in all American embassies and ministries. When President Roosevelt took office all of these officials were recalled.

Now it seems that President Roosevelt is reconstituting this function, but with greater emphasis. Should Governor Thomas E. Dewey defeat Mr. Roosevelt, political observers both within and without the government are predicting that this same step would inevitably become a part of the Republican export trade planning.

Buying Slowed on Election Eve

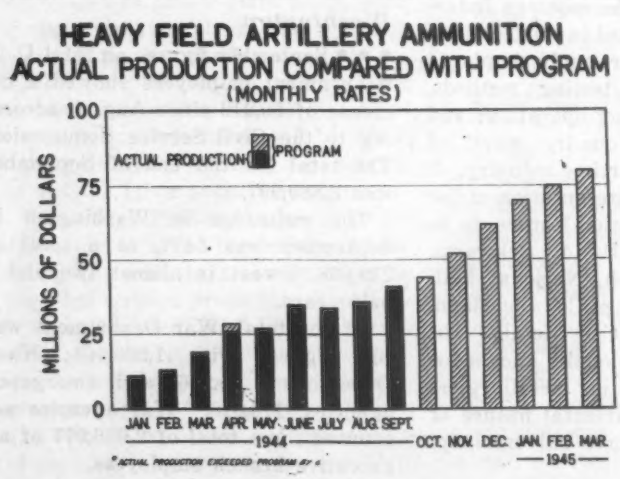
Chicago

• • • **Hesitancy attributed** to pre-election uneasiness is apparent in placing of civilian machine tool orders, local dealers report but some unrated business is being placed and more substantial amounts are appearing on the horizon. Whether the election is the actual cause of hesitancy or not, it provides a convenient hook on which to hang delays which may actually be attributable to a sizing up of the used tool situation in relation to possible ending of the war.

Virtually no large scale orders have been placed locally in the past fortnight due to the virtual completion of tooling for war programs in this sector and the fact that new programs are being directed elsewhere because of labor stringency here. Unrated civilian orders clearly are assuming a more prominent position on the books, but the units of purchase are small in most cases with many orders received calling for only one or two machines. One dealer reports that unrated civilian orders plus rated orders for essential civilian industry now are in greater volume on his books than out-and-out war orders, which in itself represents a milestone.

Deliveries on standard machines are almost universally quoted within two or three months, with four months in a few instances. Barring a rapid materialization of business under the new Russian protocol no factors now are apparent which would prevent schedules on these civilian machines from being frozen at the end of the 60 day period.

Some delays are reported on delivery promises for machines with special accessories, including d.c. motors. A few directives have been placed on equipment connected with the rocket program but apparently the greater part of this is being placed elsewhere.



National Steel Corp. Earns $1.21 Per Share

Pittsburgh

• • • **National Steel Corp.** reports net earnings after all charges, including provision for depreciation and depletion, interest charges and Federal taxes, for the quarter ended Sept. 30, 1944, of $2,667,515, equal to $1.21 per share. This compares with net earnings of $3,199,612, equal to $1.45 per share, reported in the third quarter of 1943.

Net income for the nine months ended Sept. 30, 1944, was $8,080,974, amounting to $3.66 per share, compared with $8,418,477, equal to $3.81 per share, for the first nine months of 1943.

The earnings for the third quarter of 1944 compares with $2,863,315, equal to $1.30 per share, in the second quarter, and $2,550,143 equal to $1.15 per share, in the first quarter of the year.

NEWS OF INDUSTRY

Prefabricated Invasion Ports

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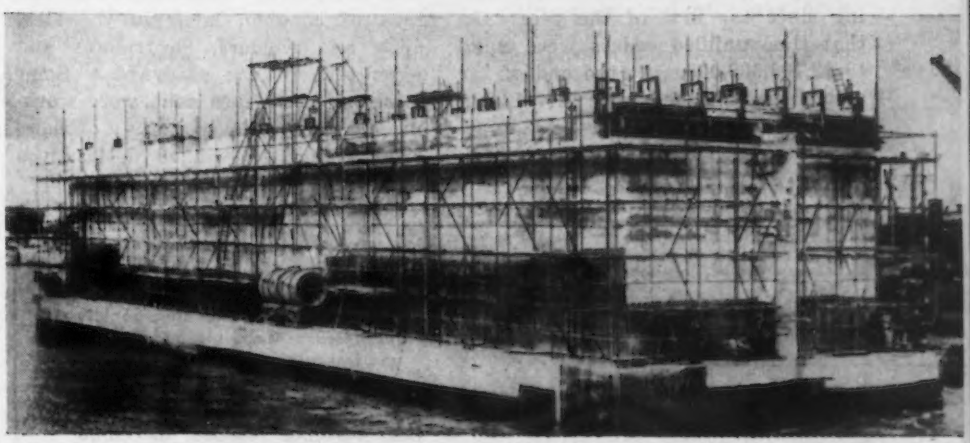

• • • Details of the greatest engineering feat of the invasion were released recently, disclosing that two complete prefabricated harbors were constructed in England, and towed across the channel after the invasion forces to feed and equip them. The harbors were formed with concrete caissons, floated across and sunk, plus sixty obsolescent ships, which sunk at high tide to help form the breakwaters with the caissons.

Steel roadways, hundreds of feet long, mounted on pontoons were also floated across the channel to feed the unloaded supplies to shore. This system permitted operations to continue during all phases of the twenty-foot tides prevalent in the area.

One harbor was planned for the use of American forces, while the other was to equip the British sector of the front, however one of the worst summer channel storms in history damaged the American port beyond repair. Operations cleaning up the Cherbourg port since the storm have replaced the loss.

Bethlehem Operating at 103 Per Cent But Order Demand Softening

New York

• • • **Bethlehem Steel Co.**'s current rate of steel operations is at about 103 per cent of capacity and incoming steel orders are supporting this rate but E. G. Grace, president of Bethlehem frankly stated: "We feel that there is a definite softening in steel demand."

For the first quarter Bethlehem's net income (subject to adjustments on final determination) was $6,621,944 equal to $1.67 a share on common compared wtih $6,733,843 or $1.71 per share of common in the second quarter of 1944 and $6,573,892 or $1.65 a common share in the third quarter of 1943.

Net billings in the third quarter of this year, Mr. Grace said, were $422,291,504 compared with $471,368,482 in the second quarter and $519,097,265 in the third quarter of 1943. Net billings for the first nine months of this year were $1,342,912,559 compared with $1,442,226,813 in the first nine months of 1943.

For the first nine months of 1944 net income was $19,788,325 compared with $19,416,795 in the same 1943 period. This was equal to $4.99 a common share in the first nine months of 1944 compared with $4.86 a common share in the same 1943 period.

Bethlehem's backlog of business, including shipbuilding, has been declining since the first of the year. At that time unfilled orders were equal to $2,109,000,000. At the end of the second quarter they were $1,471,000,000 and at the end of the third quarter of this year they were $1,344,000,000. This decline was due to completion of business rather than cancellations, Mr. Grace said.

In discussing the company's steel orders, Mr. Grace said that it was becoming more difficult to fill the order books and also indicated that there had been some switching in products recently. In answer to a question as to the type of business which would be predominant after the war in Europe ended, he said that plates would probably be the easiest steel item. He pointed to the railroads, the auto industry and the agricultural implement makers as definite postwar big users of steel and said that sheets and bars would be the main beneficiaries of this demand.

It was apparent from the tone of the interview that Mr. Grace felt that steel plates and structural shapes would be the steel items on which the most sales pressure should be placed in the postwar period. He decried the fact that fabricating shops working on regular business aside from war contracts were far from using their full capacity. Apparently the drive to fill plate mill schedules and structural rollings will be intense when the time comes that these mills are left without much, if any, backlog.

On manpower, Mr. Grace stated that his company was beginning to feel the pinch. Especially was this true of common labor in the steel mills and welders, electricians and pipefitters in the shipyards. Some workers, Mr. Grace said, were working seven days a week. Many of those were also putting in 10 to 12 hr. a day because of the lack of replacements. Repairs in steel units were being retarded because of the lack of proper help, especially common labor classifications, Mr. Grace said.

For the first time Bethlehem released actual overtime wage costs which have been mounting on a per man basis as the manpower pinch became tighter. The overtime bill for wage earners in the third quarter of this year amounted to $21,624,000; in the second quarter $22,037,000; in the first quarter $22,115,000 and in the third quarter of 1943, $26,743,000. Even though the actual amount was lower for the third quarter of this year the amount per man was higher because of fewer employees.

Total payrolls for Bethlehem were as follows: Third quarter this year, $2,456,000; second quarter, $212,175,000, and third quarter 1943, $231,113,000. Average number of employees were as follows: Third quarter this year, 251,000; second quarter, 268,000, and third quarter 1943, 296,000. Average hourly wage rates paid were as follows: Third quarter this year $1.36; second quarter, $1.348, and third quarter 1943, $1.314. As an added piece of information, Mr. Grace gave the average "take home pay" of Bethlehem workers (including shipyard and all others). These were on a weekly basis as follows: Third quarter this year $60.88; second quarter, $60.87, and third quarter 1943, $59.52.

•

• • • **Continental Steel Corp.** reports third quarter net profits of $120,522.23 declined from the preceding quarter and the third quarter of last year even though sales for the quarter, at $5,641,620.53 compared to $5,504,145.86 in the comparable 1943 period, a report to stockholders shows.

The third quarter profit figure compares with $167,573.79 in the second quarter and $147,279.60 in the third quarter of last year. For the nine months ended Sept. 30, net profit was $443,901.73 compared with $481,617.62 for the same period of 1943.

Net sales for the quarter just ended were $5,641,620.53, as compared with $5,753,895.09 for the preceding quarter and $5,504,145.86 for the equivalent quarter of 1943. Sales for the first nine months of 1944 totalled $16,773,883.81 as compared with $16,546,571.62 for the first nine months of 1943.

COMING EVENTS

Nov. 2-3—Industrial Management Society, National Time and Motion Study Clinic, Chicago.

Nov. 9-10—SAE Fuels & Lubricants, national meeting, Tulsa, Okla.

Nov. 9-10—American Zinc Institute, 15th meeting of Galvanizers Committee, Pittsburgh.

Nov. 19—Gulf Coast Chapter, Institute of Scrap Iron & Steel, Inc., annual fall meeting, Dallas, Tex.

Nov. 27-Dec. 2—National Exposition of Power and Mechanical Engineering, New York

Nov. 29-Dec. 1—American Society for Testing Materials and American Institute of Mining and Metallurgical Engineers, technical meeting, Philadelphia.

Dec. 4-6—SAE National air cargo meeting, Chicago.

Dec. 10-13—American Society of Refrigerating Engineers, 40th annual meeting, New York.

Jan. 8-12—SAE Annual Meeting, Detroit.

Jan. 10-11—Institute of Scrap Iron & Steel, Inc., annual meeting, Cincinnati.

Carnegie-Illinois Ceases Mingo Operations Closing Furnaces

Pittsburgh

• • • **Carnegie - Illinois** Steel Corp. has reported that its No. 2 blast furnace at Mingo was blown out on Oct. 21, and the sintering plant was closed down on Oct. 24, in line with the program to completely stop iron, scrap, and steel making operations at that plant. The No. 4 blast furnace was blown out in August, and the No. 3 furnace ceased production on Oct. 28. Also, the two bessemer converters which have been in operation producing synthetic scrap ceased production on Oct. 28.

It was the company's intention before the war started to close up the Mingo plant, but the critical need for steel caused by the war extended its activity until now. There is little likelihood that the plant will ever again be used by Carnegie-Illinois as an operating steel making unit.

The immediate cause of the shut down is a critical labor situation in the Pittsburgh plants plus an easing of the supply situation for steel. The labor forces are being urged to take jobs in Carnegie-Illinois plants in the Pittsburgh area.

The Ordnance Department operations at Mingo will continue and be the sole working operation there. About 700 are employed on this program, which consists of heat treating armor and deck plate that is rolled at Homestead.

Inland Steel Shows Decline in Earnings

Chicago

• • • **Inland Steel Co.'s steel** output during the third quarter averaged 106.1 per cent of rated capacity, according to E. L. Ryerson, board chairman. In the first nine months, the average rate of operations was 108.5 per cent, compared with 106.9 per cent in the corresponding 1943 period.

Inland's net earnings for the third quarter were $2,499,491, compared with $2,659,022 in the second quarter of this year and $2,512,396 in the first quarter. Earnings per share in the third quarter were $1.53, in the second quarter $1.63, and in the first quarter $1.54. For the first nine months of this year, net earnings were $7,670,-909 equal to $4.70 a share, compared with $8,738,431 or $5.35 a share in the corresponding 1943 period.

All of the company's facilities can be adapted to peacetime requirements with but minor changes. The company has prepared plans for carrying out a program of improvements and rehabilitation of facilities just as soon as new equipment and manpower become available.

Sees Private Enterprise Providing Postwar Employment

Chicago

• • • **Private enterprise will** be able to provide the 7,000,000 to 10,000,000 jobs necessary to prevent widespread post war unemployment, Paul G. Hoffman, president of Studebaker Corp. and chairman of the Committee for Economic Development, declared here recently (Oct. 24) before the 58th annual convention of the Association of Land-Grant Colleges and Universities. The employment goal can be reached through a record breaking expansion in the output of goods and services amounting to between 30 and 45 per cent over 1940, he said.

PIG IRON SUPPLY BALANCED: The supply of pig iron is no longer an acute problem. Districts which have been short in recent periods have been supplied by other areas with no serious trouble. That the situation is much better than a year ago is found in recent approvals for iron to be used as ship ballast. Inventories in the hands of producers have been fairly constant since the first of the year. It is expected, according to the Pig Iron Industry Advisory Committee that nine furnaces will be off in October for relinings with the total number of idle furnaces for that month estimated at 15 stacks. Production recently has been slightly in excess of consumption but this condition does not present an important problem as yet. Repairs and relinings in the future may take care of this situation.

Blast Furnace Capacity and Production—Net Tons

Source: American Iron & Steel Institute

	Number of Companies	Annual Blast Furnace Capacity	PRODUCTION							
			PIG IRON		FERRO-MANGANESE AND SPIEGEL		TOTAL			
									Per Cent of Capacity	
			September	Year to Date	September	Year to Date	September	Year to Date	September	Year to Date
DISTRIBUTION BY DISTRICTS:										
Eastern	10	12,749,570	899,467	8,391,867	23,063	193,208	922,530	8,585,075	88.4	89.6
Pittsburgh-Youngstown	15	26,870,760	2,020,601	18,967,614	18,723	175,198	2,039,324	19,142,812	92.7	95.2
Cleveland-Detroit	7	6,620,500	483,655	4,669,187			483,655	4,669,187	89.2	94.2
Chicago	7	14,063,510	1,065,171	9,947,168		8,780	1,065,171	9,955,948	92.5	96.8
Southern	8	5,039,470	320,611	3,097,362	11,480	125,203	332,091	3,222,565	80.5	90.4
Western	4	2,841,100	144,874	1,260,714			144,874	1,260,714	62.3	66.6
TOTAL	35	68,184,910	4,934,379	46,333,912	53,266	502,389	4,987,645	46,836,301	89.4	93.0

During 1943 the companies included above represented 99.5 per cent of the total blast furnace production.

Industrial Briefs . . .

• PLASTIC GROUP—Union Carbide & Carbon Corp. has formed a new Plastics Group, which brings together many activities that are related either to the manufacture, compounding or sale of synthetic resins and plastic products.

• NEW SUBSIDIARY — Nordberg Mfg. Co., Milwaukee, has purchased a controlling interest in the Northern Processing Machinery Co., Cleveland, and will operate it under the name of Nordberg Process Machinery Co.

• ADDITION—Fisher Body Ternstedy Mfg. plant plans to add a two-story building to its layout to provide new medical, cafeteria, hospital and employment facilities for employees. The addition, authorized by WPB, will be completed by next April.

• WITHDRAWAL—Clinton Bridge Works, Midland Structural Steel Co. and Gage Structural Steel Co. have withdrawn from the "4V" Structural Steel Companies and have formed the Allied Structural Steel Companies.

• PLANS PURCHASE—Directors of Doehler Die Casting Co., Toledo, and W. B. Jarvis Co., Grand Rapids, have approved purchase of the latter company by Doehler. Both companies are large-scale producers of automotive parts.

• MILESTONE ENGINE—Packard Motor Car Co., on Oct. 17 completed its 50,000 war engine, representing more than 67,500,000 hp. in finished engines, enough to power all cars built by Packard in its 40 years of existence.

• NEW PROJECT — Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., has been authorized by WPB to install conveyor shot blast and grinder equipment for producing tank shoes. The project involves $77,000, and is designed to speed manufacture of a critically needed casting.

• CHANGE OF ADDRESS—Hyatt Bearings Division, General Motors Corp., is now located at 1419 Central Bank Building, 436 14th Street, Oakland 12, Calif.

• CIVILIAN PRODUCTION—Electric flat-irons for civilian consumers are now rolling off the assembly line at the Mansfield Appliance Division, Westinghouse Electric & Mfg. Co. These are the first civilian consumer goods to be made at this plant since May, 1942.

• CLEANING CHEMICAL — Phillips Chemical Co., has announced Swirt, a new addition to their line of controlled cleaning chemicals. Swirt is a powerful emulsifying cleaner that acts efficiently upon all types of soil, grease, buffing compounds, cutting and machining coolants and oils.

• NEW LOCATION—Heppenstall Co. has announced the removal of its Boston office to the Chamber of Commerce Building, 80 Federal Street. Representatives are H. P. Jones and George H. Wurster.

• OPENING BRANCH — Chicago-Latrobe Twist Drill Works has announced the opening of a branch warehouse and sales office at 2043 Santa Fe Avenue, Los Angeles.

• ACQUISITION — Sheldon Machine Co., Inc., Chicago, has acquired the Vernon Line of machine tools, and production will soon start to permit deliveries shortly after the first of the year.

• PARTNERSHIP — Ace Iron & Metal Co. and Ace Wrecking & Salvage Co., have formed a partnership located in Pittsburgh, with Jay Helfant and Melvin W. Helfant sole proprietors.

• PRECISION CASTING — Kalamazoo Plating Works, Inc., has changed its name to Precision Casting Co.

Hearings on Steel Wage Case Arouses Agricultural Ire

Chicago

• • • **Refusal by the War Labor** Board to hear farm organization representatives at the steel wage case hearing has provided editorial tinder for a flaming editorial by the *Chicago Daily Drovers Journal*, leading livestock publication.

"No one is more concerned in the matter of wage levels than farmers," the publication editorialized recently (Oct. 23). "They want to see good wages, for that means a good market; but they are opposed to wage increases that would lead to price spiraling, inflation, and ruin. They have a right to be heard in any wage hearing of national importance."

The editorial pointed out that farmers are the biggest buyers of tractors and farm implements, trucks and automobiles, all of which are made by companies which are heavily unionized.

"Increased wages mean increased cost for what they need and have to buy to keep up production," it continued. "The farmer has seen where the high wages in the industries have attracted his hired help and even members of his family and have increased the wages of those he could get to work for him.

After quoting large amounts of farm products used in industry, it declared, "To say that farmers are not interested in the breaking of the Little Steel Wage Formula in the face of the above facts, shows that someone else at Washington has again lost sight of the fact that without farming there would not be any industry, and in fact there would not be even life itself."

New Features on Trucks

Chicago

• • • **New features sidetracked** when civilian truck production was stopped, and developments effected in war time models, will be included in commercial trucks produced by International Harvester Co. in 1945, P. V. Moulder, general manager of the company's motor truck division, has announced.

Two speed as well as single speed rear axles will be available in all International medium and heavy duty trucks to be made next year for civilian use. A vacuum controlled shift mechanism will be included for the two speed axles.

Hot Springs Meeting Covers Most Machine Tool Builders' Problems

Hot Springs, Va.

• • • **Problems relating to postwar markets, foreign trade, renegotiation, machine tool surpluses and relaxation of government controls, including a return to a system of free enterprise were among the many topics which concerned members of the National Machine Tool Builders Association at its 43rd annual meeting, held at Hot Springs, Va., Oct. 19-20. Several government officials spoke "off the record" about how the Russian protocol business was being handled and of the negotiations now being carried on with British officials regarding the settlement of tools shipped to Great Britain on lend-lease.**

In his opening remarks, James Y. Scott, president of the association, expressed the thought that the postwar demand for machine tools for peacetime manufacture is going to be consistent, that it will be large by comparison with the average prewar experience and that if the member companies are allowed to remain sufficiently strong financially to tide over the intervening period, the industry will eventually emerge a far larger industry than it was when the war started. He based this optimism on two factors:

(1) During the war, America has become committed to precision manufacture, and precision manufacture of peacetime products will require large quantities of new machine tools because there are limits to the extent to which war machine tools can be adapted to those purposes.

(2) American is committeed to the principle of high level employment made possible by mass production and low costs. The machine tool is the means whereby American industry can achieve these ends.

Mr. Scott warned, however, that there is a serious situation developing in the machine tool industry which seriously threatens the ability of American manufacturers to make the shift from war to peace fast enough to assure continuity of employment. This is largely due to the fact that machine tools for peacetime production carry no ratings today; they must come out of the 25 per cent of production allocated to foreign business and essential civilian uses. Russian business has heavily cut into this kitty, and manpower shortages and conversion to direct war work leaves the manufacturer with little manhours for unrated civilian orders. (On only half of these unrated orders have delivery dates been given, mostly after March 1945, other speakers indicated.)

As an example, Mr. Scott indicated that there are certain machine tools which the automobile industry needs right away if it is to effect a quick conversion from war to peace. It is not getting these tools. It is almost impossible for the machine tool builder to promise any sort of deliveries on these orders, Mr. Scott said. Then he added:

"When this war started, we were accused of being the bottleneck of war production. I will make the prediction that unless government releases its restrictions upon our production of machine for peacetime purposes, within six months from today we will be accused of being 'the bottleneck to peacetime employment.' We won't get anywhere in this picture unless and until the various governmental agencies concerned in this problem realize that unless we are permitted right now to build and ship certain critical machine tools needed for reconversion, *the postwar reemployment program of the United States of America may run onto the rocks.*"

Another problem facing the machine tool builders is surpluses of warbuilt equipment. As long as nothing is done with these surpluses, Mr. Scott feared they will hang over the market as a threat and will act as a brake. Hence, he urged the machine tool industry to use every effort to bring surplus machine tools on the market and get them operating in the postwar economy. It is only by a program of this sort that the industry can succeed in pushing off factory floors and onto the junk heap the thousands of wornout, obsolete machine tools that have lived this long only because of the urgency of the war requirements, Mr. Scott concluded.

Expanding upon this theme, Walter K. Bailey, vice-president, Warner & Swasey Co., said that the problem of disposal of surplus machines does not

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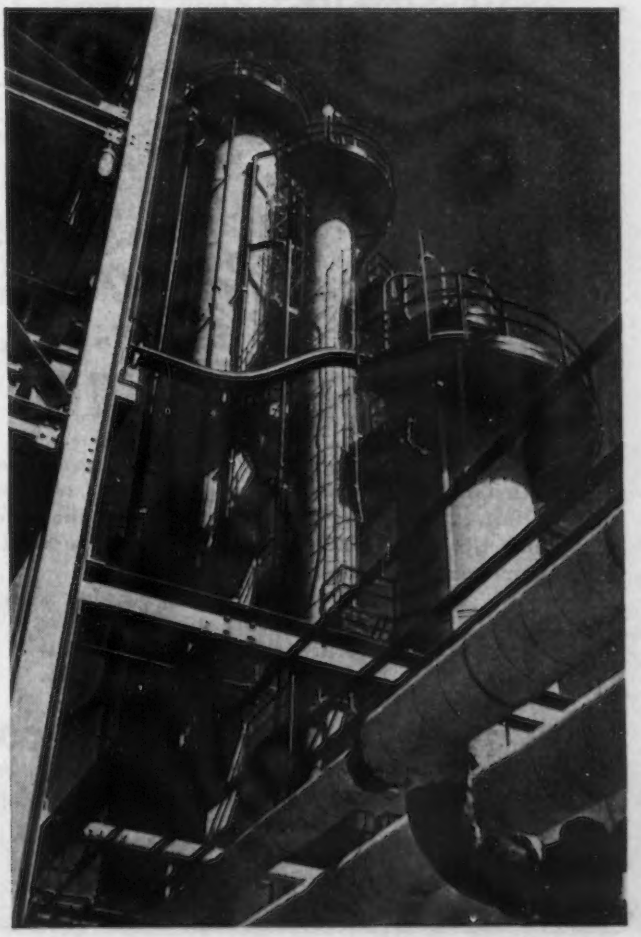

"SKY-OCTANE" — ***Towers of the alkylation unit of Rickfield's refinery near Los Angeles combine iso-pentane and iso-butane into alkylate, a vital component of super-octane aviation gasoline.***

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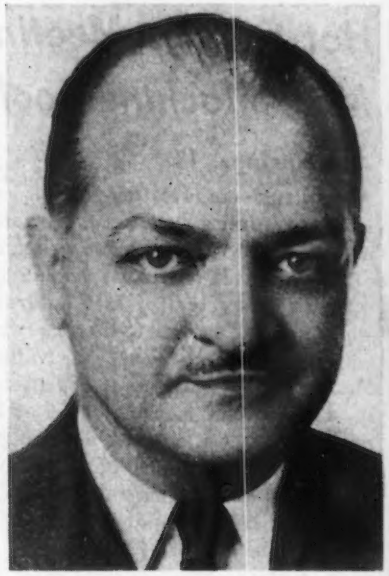

JOSEPH L. TRECKER: Executive vice-president of Kearney & Trecker Corp., who was elected president of the National Machine Tool Builders Association, succeeding James Y. Scott.

lie in foreign markets, but right here at home. Although many companies have expressed an interest in purchasing from the government certain of the government-owned machine tools, few have bought any. Mr. Bailey urged that the industry promote the maximum postwar use of warbuilt machines in American plants first, because American factories need these machines to provide high level employment and low cost production, and second, because until these surpluses can be disposed of, no real progress can be made in postwar selling of new machine tools.

With the great supply of so-called surplus machine tools built during the war, American industry will have a chance to scrap its vast accumulation of ancient and obsolete machine tools and replace them with wartime models, he added. These wartime models are just as good as any machine ever made and certainly are of far better design and in far better condition than the hundreds of thousands of machine tools built between 1910 and 1930, which are still in use, the speaker said.

In a report presented by William P. Kirk, vice-president, Pratt & Whitney Division, Niles-Bement-Pond Co., criticized certain clauses of the surplus property disposal bill recently enacted by Congress and signed by the President. From the industry's point of view, he particularly deplored the fact that final authority will rest in the hands of a three man board, each having an equal voice. Mr. Kirk also thought that the provisions of the bill establishing priorities for tax sup-

At last we dare to hope for a change in America's industrial scene. Reduction in the manufacture of war machinery will naturally be followed by the increased production of articles of peace. But the war-learned techniques of fast, accurate production will be applied to speed the supply to a vast demand.

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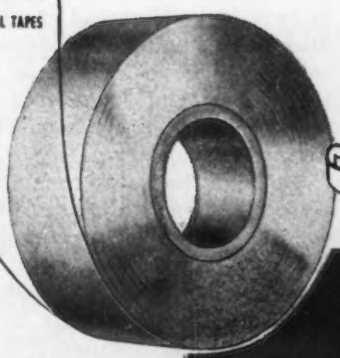

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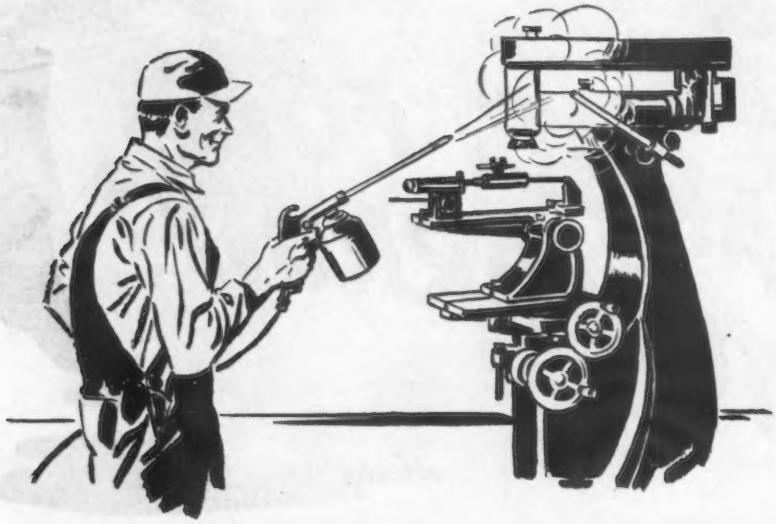

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ported institutions or political institutions would result in delays in disposing of surplus machinery.

Even more delays will be encountered in the sale of properties worth $1 million or more, on which the Attorney General is given 90 days in which to render an opinion as to the validity of the sale under the law. Congress itself is given 30 days in which to turn down or give silent assent to sales agreements involving over $5 million. The effect of such delays on negotiations for plant sales can well be imagined, Mr. Kirk said. Otherwise, the provisions of the law and the present policy of the RFC in handling disposal, closely parallel the recommendations of the National Machine Tool Builders Association.

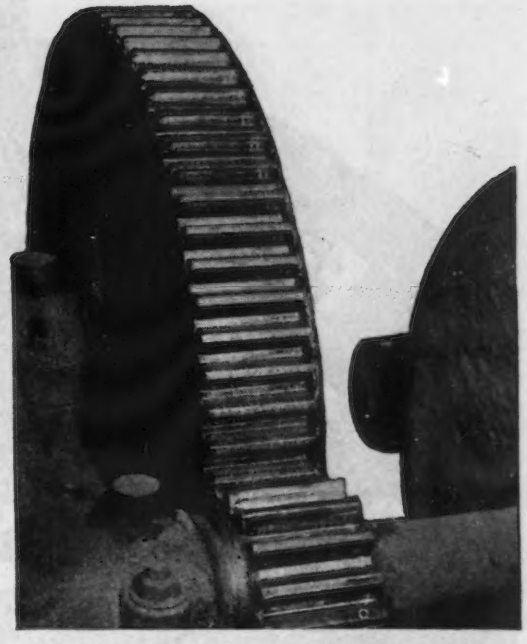
Mr. Kirk noted that in surplus disposal, in taxation and in reconversion, that has been a very strong tendency for Congress to discriminate between big business and small business. The machine tool industry, which is largely made up of small business, is opposed to any such artificial distinction. "Large business is our customer, and we cannot prosper unless it prospers too," the speaker concluded.

Reporting for the committee on government relations, A. G. Bryant, vice-president, Cleereman Machine Tool Co., also deplored the fact that the recent legislation on surplus property disposal was so encumbered with unsound clauses as to constitute an inefficient form of organization. He stated that in taxation, in renegotiation, in manpower problems and otherwise, the machine tool industry is failing to receive the consideration to which it is entitled as one of the most basic industries in the country. He pointed out that the machine tool industry has been penalized by taxation, subjected to a discriminatory renegotiation act and during the past year robbed of much of its vital manpower for two primary reasons: First, the industry is relatively too small in personnel and in ownership interest to have any widespread effect on political thinking, and second, not enough public officials have learned the fundamental importance to the country of a constructive public policy toward the industry.

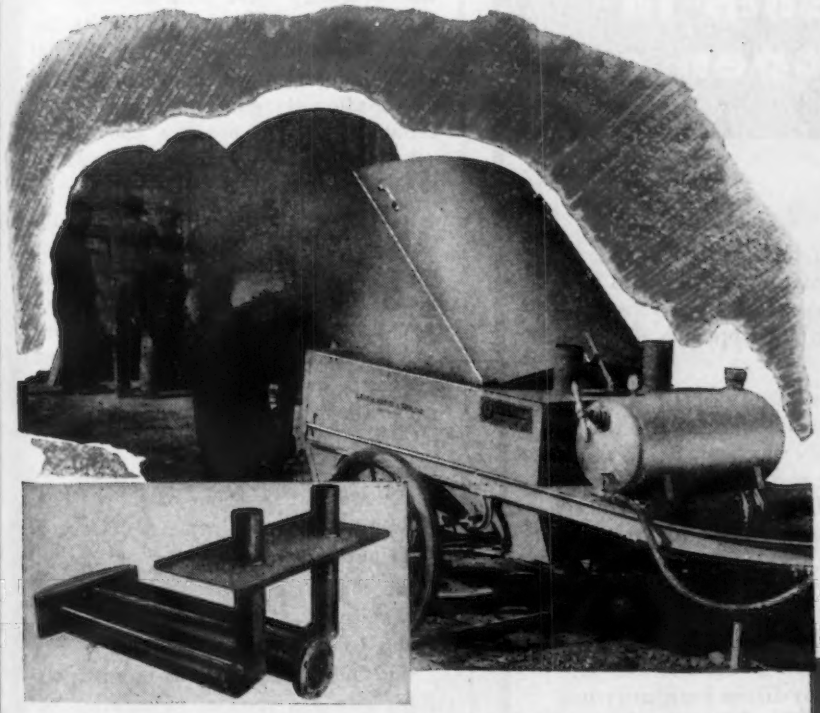
Although the industry employs only some 58,000 men, it has had throughout the war period a constant struggle to retain sufficient key men to satisfactorily accomplish the programs for war production demanded of it, Mr. Bryant declared. When after top officials in government had indicated a year ago that the peak of

WE ANNOUNCE the recent addition to the Murex line of Type MA—the first true Grade E-7011 electrode. A general purpose rod, which handles easily in all positions, Type MA is designed primarily for A.C., but may also be used with D.C., reverse polarity. It deposits weld metal of high tensile strength and can be used on Carbon-Moly. and other 70,000 P.S.I. steels.

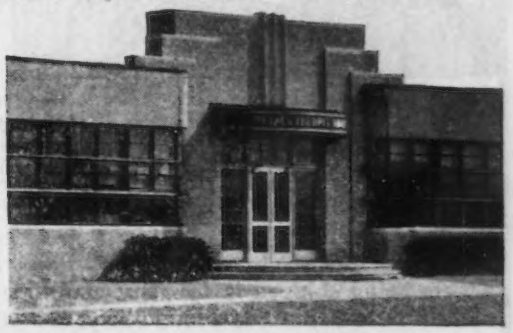
Further information on request.



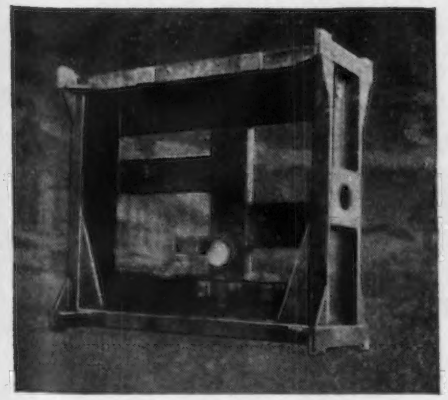
OPERATING INCHES deep in coal dust, these spur gears have been driving the mechanism for conveyor and cleaner cones since 1932. The gears are cut from Murex welded gear blanks, fabricated by Lukenweld, Inc. from rolled steel plate, which is free from blow holes, sand pockets or other internal defects sometimes found in poured blanks.



IN THE MELTING OF ASPHALT, temperatures up to 2,000°F. are generated by the heat flue system, which is welded with Murex Electrodes by Littleford Bros., Inc. The melting kettles are also fabricated with Murex and, according to the manufacturer, the welds stand up under the terrific heat "exceedingly well."



ELECTRODE RESEARCH and development work is carried on at the Metal & Thermit laboratory at Woodbridge, N. J. Raw materials, including the core wire and flux ingredients, are carefully analyzed in order to produce electrodes of certain pre-determined characteristics. Electrodes are tested for their operating and deposition characteristics and the quality of the weld metal.



THE MACHINE TOOL INDUSTRY speeds vital production through the use of arc welding. Other advantages of welded construction are ample rigidity with less weight than obtained with castings, and lower cost. The base illustrated was welded from flame-cut plates by The Dayton Fabricated Steel Co., with Murex Type FHP electrodes—"hot" downhand rods which produce sound, X-ray clean welds of high tensile strength and good appearance.

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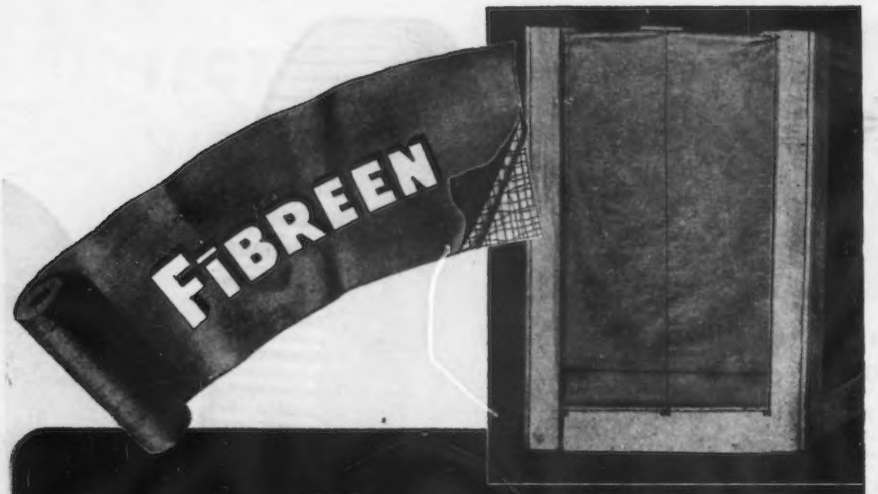

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machine tool production was over and urged builders to take on direct war work, the industry was completely stymied in its efforts to build its regular machines when sudden loads were imposed. Mr. Bryant inferred that insufficient notice had been given by the General Staff of the large munitions program last spring, which is still not completely absorbed. Efforts are currently being made through the WMC and elsewhere to see that the machine tool industry is given more preferential treatment by the U. S. Employment Service offices.

Excess profits taxation has been a subject of contention for some time. Mr. Bryant indicated that many machine tool builders had applied to the Treasury Department for relief under Section 722. Through the association, a plea has recently been made to have the Treasury give consideration to each company's case on its merits, instead of lumping them among the list of 32 industries which are not likely to be allowed relief on their excess profits tax base because they were not depressed in the base years of 1936-1939.

Reviewing the "ever stinging" subject of renegotiation, the speaker stated that renegotiation in 1942 reduced net profits in the machine tool industry after all charges to 5.1 per cent of gross sales, of which about one-third, or 1.5 per cent of sales is in the form of postwar profit refunds not now available in cash. The estimated cost of renegotiation to the industry was 4.1 per cent of sales, thus reducing net profits after all charges by 44 per cent.

The committee headed by Mr. Bryant has constantly called the attention of the RFC Price Adjustment Board to the fact that a general application of the same method of calculation to the industry's 1943 business as was used in 1942 would be disastrous. Because of varying factors applying in 1943, such a procedure would leave a "pitiful" total of about $6 million, according to Mr. Bryant. Preliminary hearings on 1943 profits have been held with approximately a dozen machine tool builders; only one company, however, has concluded renegotiation for 1943 with the RFC Board.

As a whole, the industry had a 20 per cent lower rate of income before Federal taxes in 1943 than in 1942. Bryant estimated that net earnings after taxes amounted to 7.2 per cent, of which 1.6 per cent has been paid out in dividends and 3.6 per cent was

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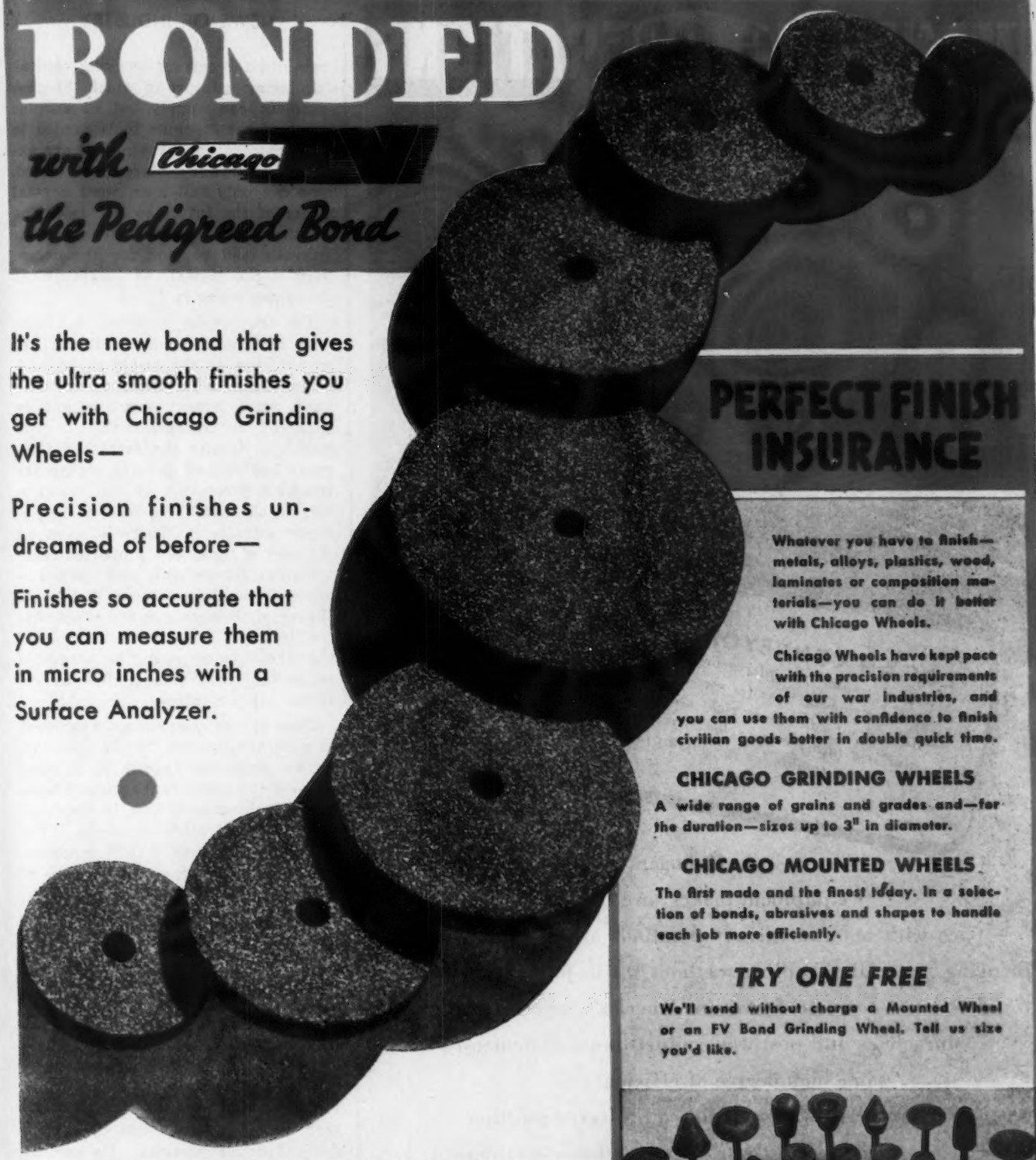

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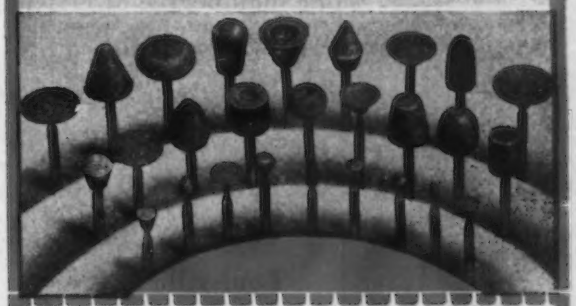

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retained for current working capital. "If facing a future in which the government can supply out of surplus most of the machine tools needed in the next decade, these profits are excessive," Bryant declared, and added, "we can only call upon some crystal gazer of the future to tell us in the tough years ahead how to meet our payrolls and provide for the necessary technological advancement of American industry."

On the whole, however, in talks with RFC board members, Bryant reported that as the result of an educational campaign on the committee's part, more lenient action might be expected on renegotiation of 1943 business, despite the fact that Congress had turned down a clause for complete exemption of the industry. He stated that there was a sympathetic attitude in Congress, even on the part of those who supported renegotiation in general, and quoted a letter from Congressman Welsey E. Disney of Oklahoma to the effect that the later had consistently maintained that the industry would be permitted to retain reasonable profits as reserves for the future.

Since export sales have always been of great importance to the industry, Bryant expressed concern as to what is going to happen to the surplus lend-lease machine tools now in England, Australia and other countries. The disposition of some 58,000 machines in England alone is involved. Some of these matters are currently under discussion between the governments involved.

Speaking on the subject of markets abroad, John J. Abbink, vice-president, McGraw-Hill Publishing Co., predicted greater foreign sales in the next 10 years than in the past decade. He pointed to the necessity of rehabilitating Europe, Russia's plans for rebuilding its industries and the vast untapped markets in China, India and South America. He emphasized the general trend to a higher standard of living and the corollary that other nations will have to adopt the American plan of installing labor saving machinery to supply mass markets.

Shipping American machine tools to other countries will not be enough, Mr. Abbink said. He envisioned a new American task force of production engineers going abroad to supervise the installation of this equipment and perhaps in many instances staying to run the plants. There are plenty of foreign funds in American

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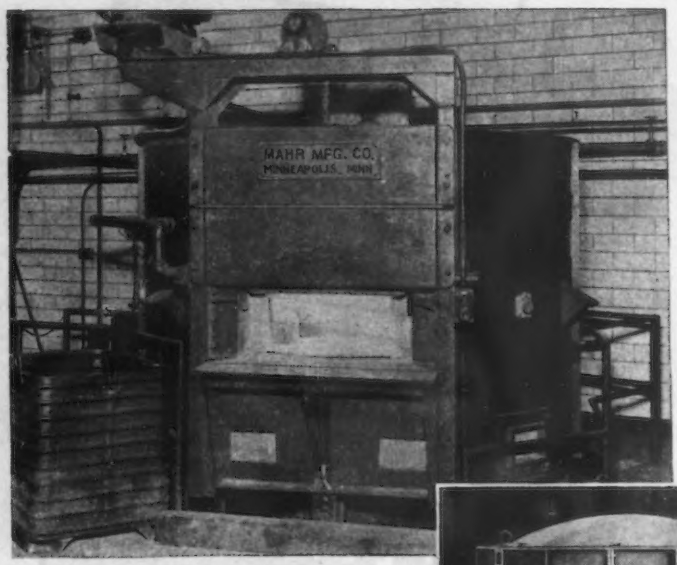
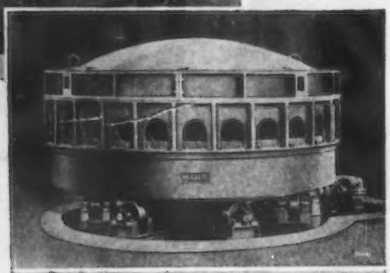
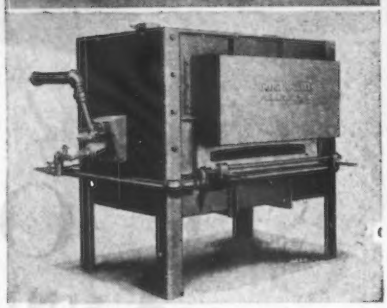


(Left) MAHR Center Fired Rotary Hearth Furnace. One of a battery of these furnaces in the very modern forging plant of a large midwestern manufacturer.

(Below) MAHR Rotary Nosing Furnace used for heating the nose of high explosive shells. Continuous high production is characteristic of this center fired rotary. In this furnace, however, the entire furnace rotates.





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banks to pay for this machinery, the speaker maintained.

Abbink warned that the British will make noisy efforts to exclude American machine tools from Continental and British Empire markets, but he predicted that they would fail in their purpose since they will not be able to furnish the equipment in time to meet the immediate postwar demand. Therefore, no time should be lost in seeking out these markets, he counseled.

After analyzing postwar markets for automobiles based on normal demand and the rate of scrapping of old cars, which has remained unchecked during the war period, B. D. Kunkle, vice-president, General Motors Corp., estimated that 20,000 machine tools will eventually be required by the automobile industry to attain an annual production of 6,000,000 cars. Except where cost factors predominate, tooling will have to be improvised at first. After screening all its initial requirements, however, General Motors finds it must have immediately 2500 critical machines to replace facilities sold to other manufacturers at the start of the war production program. Of the machines on order, delivery dates before March 1 have been given on only 35 per cent and within six months on 15 per cent. No deliveries have yet been set on the remaining half of GM commitments, although WPB officials have been urging machine tool builders to fit in such unrated orders in the 25 per cent of their volume not absorbed by Russian business.

Observing that even nations like Great Britain are drifting to the left and that collectivism is creeping into the world, Robert M. Gaylord, president of the National Association of Manufacturers and of the Ingersoll Milling Machine Co., cautioned that any change made in the political economy of the United States would be gradual—it would be taken in "short, small, subtle steps." Speaking at the annual dinner of the NMTBA, he urged manufacturers to resist encroachments on their rights now and in particular to resist those government regulations not put into the basic law by Congress. While he saw more government regulation in the offing, Mr. Gaylord counseled his audience to learn how to operate for the general good within the realm of such regulations. In a free, competitive system of private enterprise, government is necessary to prevent injury to the community and to see that the rights of labor are not destroyed.

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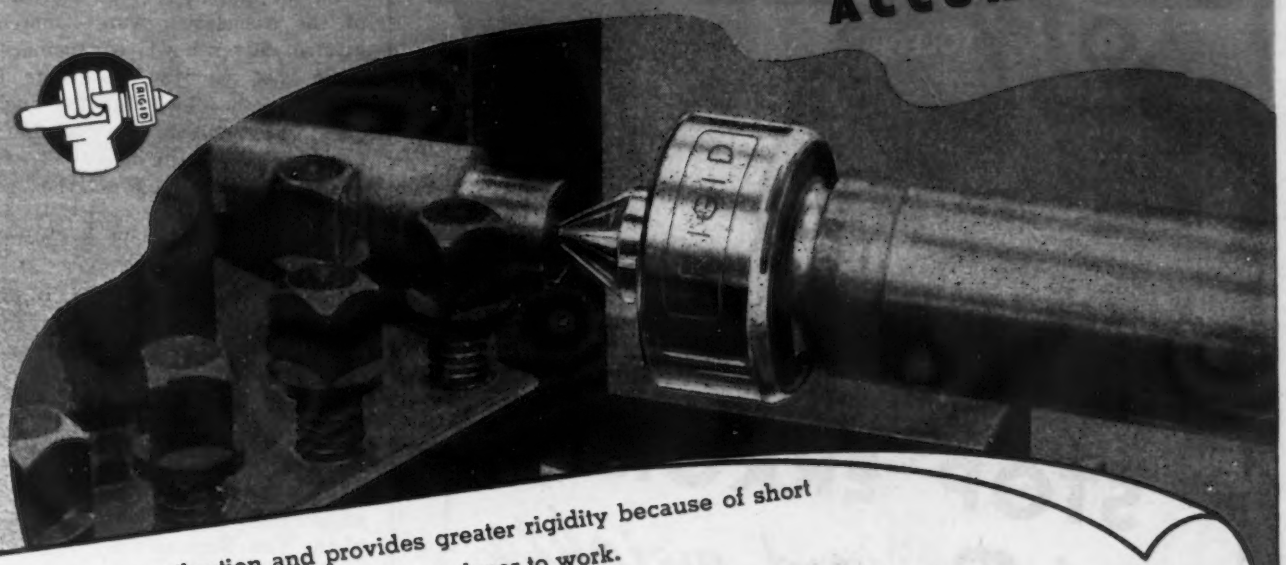

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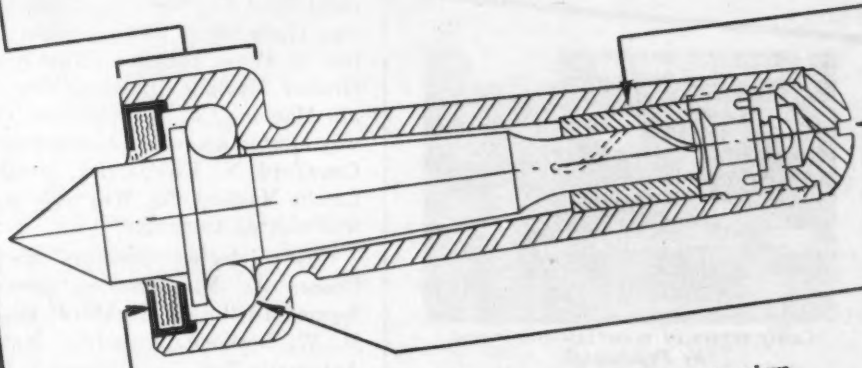

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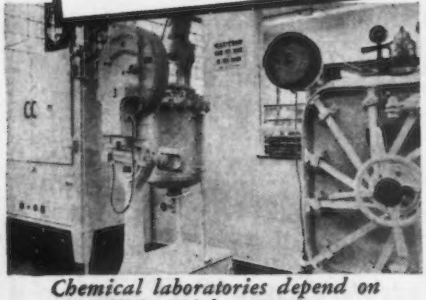

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Competition, he said, is the hallmark of free enterprise and must be preserved. When properly controlled, competition is of benefit to all concerned, Mr. Gaylord maintained, since it spurs the development of new ideas and processes. The public is the ultimate judge and the decision is not always given on the basis of price.

At the dinner, four past presidents of the association were honored by gifts of silver bowls commemorating their past services. Excerpts from their speeches made as far back as 1909 were quoted to show that the problems facing the industry have not basically changed over the years. These men were Frederick L. Eberhardt, president, Gould & Eberhardt (president 1907-09), Edward P. Bullard, Jr., president, Bullard Co. (1911-13), James B. Doan, chairman, American Tool Works Co. (1915-18) and August H. Tuechter, president, Cincinnati Bickford Tool Co. (1920-22).

Joseph L. Trecker, vice-president, Kearney & Trecker Corp., Milwaukee, was elected president of the NMTBA succeeding James Y. Scott, president of the Van Norman Co.

William P. Kirk, vice-president, Pratt & Whitney Division, Niles-Bement-Pond Co., West Hartford, Conn., was elected first vice-president; Herbert H. Pease, president, New Britain-Gridley Machine Division, New Britain Machine Co., New Britain, Conn., was elected second vice-president, and Crawford N. Kirkpatrick, president, Landis Machine Co., Waynesboro, Pa., was elected treasurer.

Newly elected directors are Mr. Pease, A. M. Johnson, president, Barnes Drill Co., Rockford, Ill., and H. W. Bockhoff, president, National Automatic Tool Co., Richmond, Ind.

Discussing the postwar outlook, Trecker, newly elected president, said that because machine tools are a major factor in cutting production costs and increasing productivity, the machine tool industry is the key to the whole postwar economy of the United States.

"Manufacturers who sell products and merchandise to the public," Trecker said, "must get their prices down low enough to assure continued large scale buying. If the nation can be successful enough in making more goods for more people at lower prices, I believe that the country has a good chance of reaching the postwar volume of $150 billion estimated to be required to maintain high level employment."

★Within the past few years several Lectromelts, with a range of capacities from 500 lb. to 10 tons per heat, have been installed for billet-size ingot work. This simplified method affords greater tonnages in the steel industry's increasing use of direct arc type furnaces for the production of plain carbon steels for rolling into merchant and reinforcing bars, sheets and other similar products.

In most instances, billet-size ingots are poured so that they can be rolled with one heating. Some of these ingots are as small as 2-inch square by 4 feet long.

Billet-size ingots for rolling into bar stock are ordinarily top cast with a slight taper so as to facilitate ready stripping. Just before the tops solidify, a staple is inserted in the small ingot, and the stripping is usually done by a bar suspended on a hook of a crane, so as to pull out four to six ingots from their moulds at a time.

The billet-size ingots solidify rapidly with practically no pipe. These ingots are noted for their uniformity and fine grain structure. Coarse structure, which frequently characterizes large ingots, is avoided by the rapidity of solidification.

It is customary to quickly transfer the plain carbon billet-size ingot to a continuous type heating furnace for bringing the ingot up to uniform rolling temperature so that it may be rolled direct with one heating. Any required cropping is done after the rolling. In the plain carbon billet-size ingot process, it is customary to obtain highest yields of merchantable bars. The end crops can be returned to the furnace for remelting.

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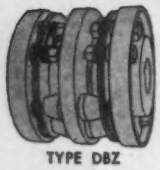
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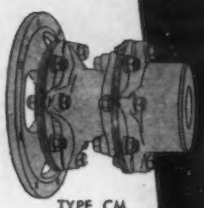
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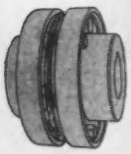
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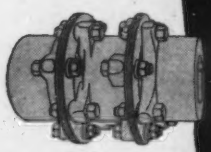
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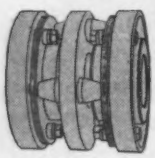
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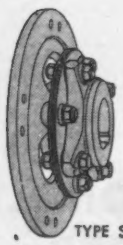
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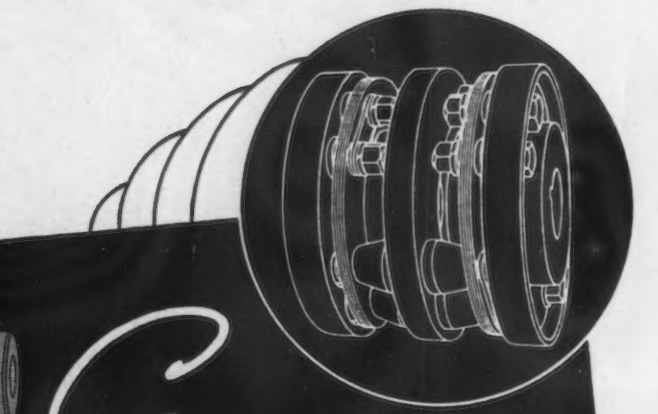

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BACKLASH, FRICTION, WEAR AND CROSS-PULL

.....the 4 destructive evils found in all other types and makes of couplings.

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FREE END FLOAT

These are the five essential features of Thomas Flexible Couplings that insure a permanent care-free installation.

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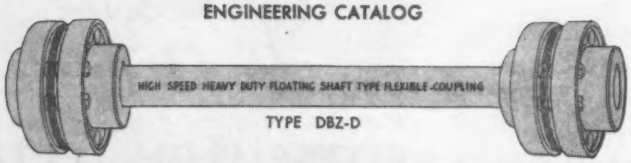

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THE THOMAS PRINCIPLE ELIMINATES CHAINS, SPUR GEARS and other VIBRATING MAKESHIFTS

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA

India May Be Strong Postwar Market For American Production

New York

• • • **India can develop** into a profitable postwar market for export of American made goods, according to Col. C. Warren Boulton, managing director of Machine Tools (India) Ltd., who spoke recently before a meeting of the Export Managers Club of New York.

He cautioned that plans to go into this and other Asiatic markets must be preceded by careful consideration of the field. In India, the low standard of living must be faced realistically in deciding what products to market. The articles must be cheap, in a price field to compete with Indian made goods, as well as of good quality. In general, Col. Boulton feels that American exports to the Indian market will fall into two categories, those listed above, competing with Indian made, Japanese, and British goods in price. Another type of goods, so superior in quality that price is no object will of course be a part of the luxury trade.

Packaging was emphasized as another important part in Indian merchandizing. The Colonel stated that people there are attracted to bright packages, that a colorful wrapping may have a beneficial effect on the way the product is received.

In a discussion of credits, it was stated that India possesses a $2,828,000,000 credit in London, as of March this year. Noting that this credit cannot be used for American purchases while India remains in the pound sterling bloc, Col. Boulton also reminded the group that when the rupee was not linked to the pound it fluctuated "violently."

He stated that, "My own opinion, is that as soon as India attains its independence after the war, as it may, divorcing itself from the pound, the rupee will appreciate considerably in relation to the pound and dollar."

Termination Booklet Issued

Cleveland

• • • **A contract termination manual** containing 137 pages and presenting in detail the steps and procedure to be followed in terminations has been made available by Jack & Heintz, Inc. The booklet is for the use of the company's vendors and subcontractors.

Safety increases production . . .

"A.W." Rolled Steel Floor Plate provides safety from costly slipping accidents. Allows workers to perform their jobs with confidence and greater speed. Floors with heavy traffic receive permanent protection. No cracks, no ridges, no worn or slippery surfaces. No time out for repairs. Shown is the Super-Diamond Pattern which resists slipping in any direction. Can be installed overnight without disturbing production. Write for folder.

Other products include Plates, Sheets, Billets, Blooms, Slabs—Carbon, Copper or Alloy analyses.

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MAIN OFFICE AND MILLS: CONSHOHOCKEN, PENNSYLVANIA : SINCE 1826. District Offices and Representatives: Philadelphia, New York, Boston, Atlanta, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Houston, St. Paul, New Orleans, Pittsburgh, Roanoke, Sanford, N.C., St. Louis, Los Angeles, San Francisco, Seattle, Montreal.

The Strong Way

Pays in many ways

YOU CAN PUT IT ALL UP TO STRONG, *if you have a steel casting from 30 pounds to 30,000 pounds—or a size range of almost any conceivable shape or proportion. The sweep method shown above—typical of Strong's versatility—saves the customer the costly pattern making otherwise needed for this unusually shaped, 33,000 pound casting. Strong molding facilities range from small snap flasks to steel flasks 16 feet square. This size range is governed only by the size of Strong's largest annealing oven (15 x 19 feet). Be sure you know the modern art of steel casting, as Strong has developed it!*

STRONG IN NAME
STRONG IN FACT

STRONG STEEL FOUNDRY COMPANY, BUFFALO, N.Y.

Strong

TENSILE STRENGTH · ELONGATION

Bethlehem Modernizes Hoboken Yard For Handling of 28 Ships

New York

• • • **The Bethlehem Steel Co.'s Hoboken yard staged a "Postwar Preview" inspection trip of its facilities for more than 300 representatives of American shipping operators recently.**

George H. Bates, general manager of New York yards for the Bethlehem Shipbuilding Div., explained that although the yard now is largely engaged in war work, the inspection tour had been arranged "to present shipping interests with a preview of the facilities which will be available to them when victory has been achieved."

"The two-year construction program," Mr. Bates said, "was designed to minimize interference with the handling of the maximum ship tonnage permitted by the original facilities."

The Hoboken yard now extends more than 2000 ft. north of 12th and Hudson Streets compared with a frontage of about 700 ft. prior to the war. When the program got under way late in 1942, the facilities of this yard consisted of three wooden piers, two fairly modern drydocks, and a series of obsolescent buildings and sheds. Aside from the machine shop, which was famous for its production of sidewheels and turbine engines, little modernization had been accomplished since the founding of the yard at its present site by W. & A. Fletcher in 1890. When Bethlehem acquired this property from United Drydocks in 1938, the yard had a capacity of eight ships aggregating approximately 80,000 tons.

The job of renovating the yard actually called for an almost complete rebuilding.

The three old wooden piers, each 725 ft. long, were torn down and replaced by three modern treated timber, steel and concrete structures ranging from 740 to 760 ft. in length and from 30 to 40 ft. in width. The new piers were placed adjacent to the old to permit the use of the latter while the new construction was going on. The old drydocks, one of 8000 tons capacity and the other of 10,000 tons, were fairly modern and were renovated," Mr. Brown continued.

On the site of the former ferry slips a fourth pier was constructed under government contract and two huge drydocks were installed. More than 810 ft. long and 40 ft. wide, Pier 4

TODAY'S HIGH SPEEDS AND FEEDS DEMAND CORRECT *Motor Power*

. . . For Sustained Precision Performance

PoweRated
Engineered for a Specific HP. Range

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Milwaukee PowerRated Milling Machines

- Standard Models — Horizontal, Vertical and Bed Types — available in Motor ranges from 3 to 25 HP.
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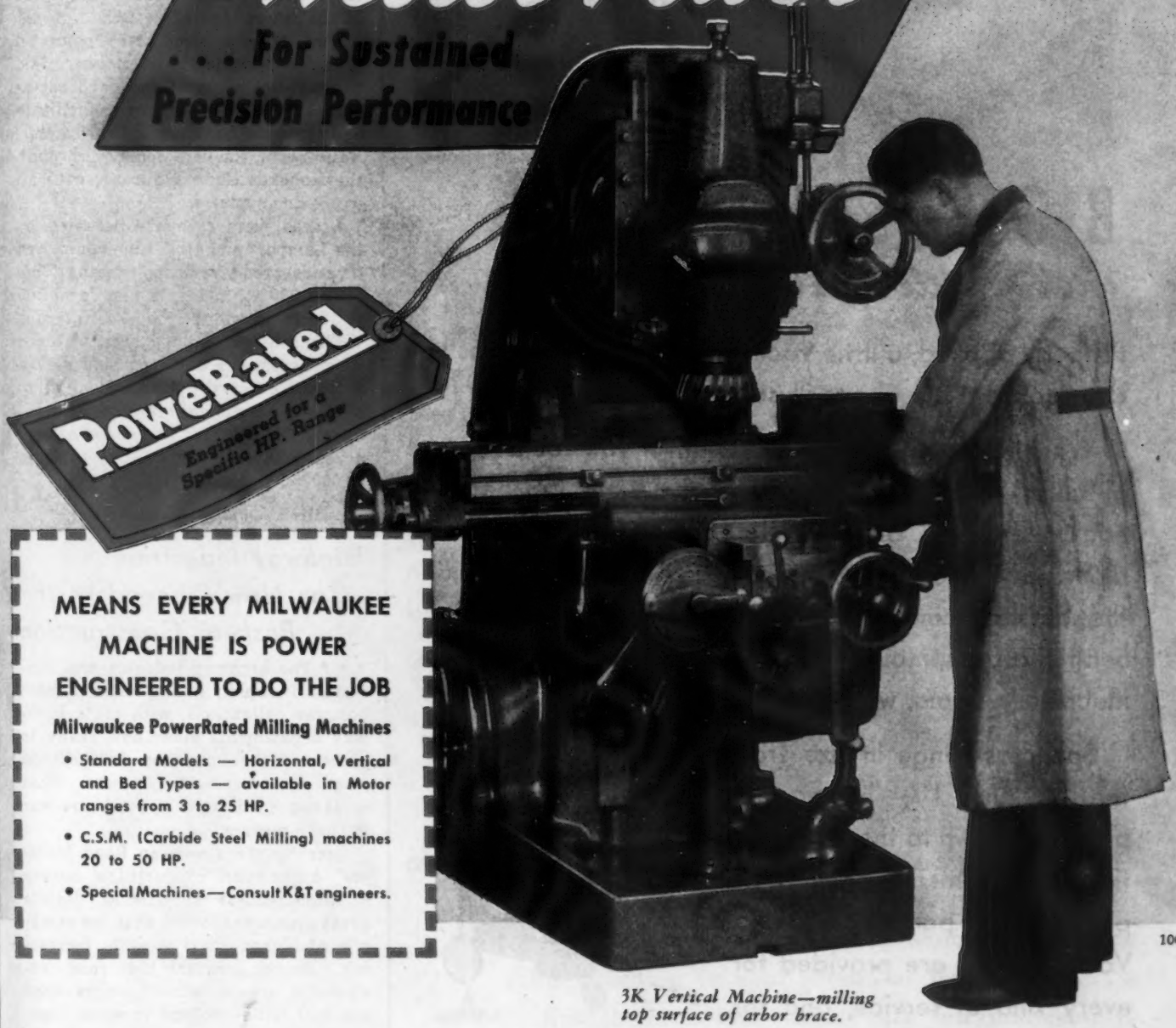


1000-P

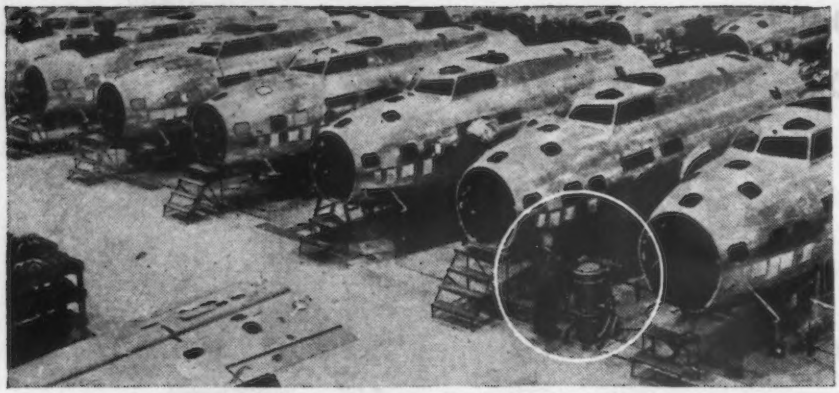
3K Vertical Machine—milling top surface of arbor brace.

Milwaukee Milling Machines are power-engineered—PoweRated—designed and built for precision performance with balanced power—every machine has a definite power-rating with ample reserve for all overloads normally encountered within its field of job applications.

There is no necessity of changing motors to gain power and speed—the range of models of Milwaukee Milling Machines makes available a specific machine amply powered for every class of job. And you can be sure of sustained precision performance because every machine is engineered and built in proper relation to its power. And remember there is a PoweRated Milwaukee best suited to your specific needs.

KEARNEY & TRECKER CORPORATION
MILWAUKEE 14 WISCONSIN

Milwaukee Machine Tools

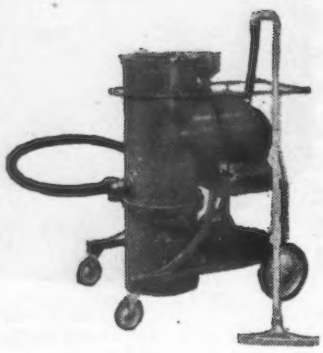


BIG BUSINESS
with a little SPENCER VACUUM

Properly applied, a little vacuum goes a long way, as you can see from the above illustration.

What would it mean to your plant if you could remove all chips, rivets, sawdust or dirt from the job between each operation? Users say that cleaning before painting alone saves the cost of a Spencer Vacuum. In addition the same machine can reclaim materials, improve fire and health hazards, move materials and save time in cleaning machinery, floors, walls and ceilings.

Spencers range in size from the 3/4 and 1 1/2 horsepower portable shown to the large stationary systems which can be piped to any part of the plant. Vacuum tools are provided for every kind of service, and for every kind of material from lead to liquids and from lint to the finest powders. Ask for the bulletins.



Also for

HULLS
WINGS
INSTRUMENTS
TANKS
AND
SERVICING

SPENCER HARTFORD VACUUM CLEANING

THE SPENCER TURBINE COMPANY, HARTFORD 6, CONN.

was built of reinforced concrete on steel tube piles driven down to bed rock.

The two new drydocks, which adjoin Pier 4, were built to handle vessels ranging up to 20,000 tons each and are of the latest type of design.

Two of the piers were equipped with tower cranes and rails were laid to make all areas of the yard accessible to locomotive cranes to facilitate and speed the handling of heavy items. Rail lines in the yard connect, through the Hoboken Shore Railroad, with all trunk line systems.

Leased piers formerly occupied by the Lamport and Holt Line comprised three covered structures ranging from 865 to 920 ft. in length and from 100 to 120 ft. in width.

This construction program combined with the leased acquisitions now makes it possible for the Hoboken yard to handle 28 vessels aggregating approximately 280,000 tons at one time compared with only eight ships totaling 80,000 tons originally.

Highway Industries Can Now Proceed With Postwar Construction

• • • **The highway industry** and profession is rapidly fitting itself to meet postwar obligations, with state highway departments alone now ready to proceed with more than $400,000,000 worth of construction projects. That is about equal to a typical pre-war annual program.

Recently the American Road Builders' Association conducted a survey of preparedness and found, despite great manpower losses, that the stockpile of blueprints is steadily increasing. By the time the 1945 road construction season arrives, more than one-half billion dollars in state highway construction projects will be ready. By Oct. 1, 1945, the total will be in excess of one billion dollars.

In addition to the state highway blueprints there are city, county and local road and street projects which should at least equal the state highway volume.

However, all highway agencies are still confronted with a tremendous planning and designing job. Urgent highway needs which must be met in the first few postwar years exceed ten billion dollars in cost.

The road job ahead appears difficult, but highway construction can absorb vast quantities of labor, materials and equipment.

HOW DO YOU KNOW THEY WON'T "FORGET" THE LOCK WASHER?

THEY CAN'T "FORGET" WITH SEMS FASTENER UNITS!

● The Sems Fastener Unit is a combination of a pre-assembled Shakeproof Lock Washer and Screw . . . a lock washer is on *every* screw, and it can't drop off!

Using Sems Units makes the entire assembly operation faster and more efficient with the assurance of locked-tight parts. Sems Units help solve many other assembly line problems especially by eliminating unnecessary, time-wasting operations. Shakeproof Engineers can prove these advantages and show you the most practical way of using this fastening on your products. Write today . . . a field engineer will consult with you immediately!

SEMS FASTENER UNITS

Reg. U. S. Pat. Off.

Pre-Assembled Shakeproof Lock Washer and Screw

Worker can't "forget" the lock washer • Lock washer can't drop off • No lost or wasted lock washers • Only one unit to handle • Saves time • Speeds assembly

Write for Free Test Kit No. 23

ARMY E NAVY

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"fastening Headquarters"

Distributor of Shakeproof Products Manufactured by ILLINOIS TOOL WORKS

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Shakeproof Quick Fasteners . . . for Immediate Opening and Locking

SEMISILICA BRICKS

DURATION OF HEAT AFFECTS REFRACTORIES

Following statements are based on temperature range from 2200° F to 2700° F.

SHORT DURATIONS OF HEAT

Furnaces with daily or shorter firing cycles usually require a good clay or super duty brick.

MODERATE DURATIONS OF HEAT

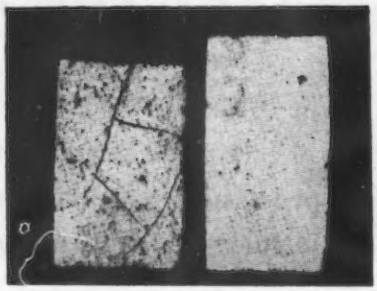
Furnaces with firing cycles of days, weeks or months require refractories which will not vitrify, shrink or spall, from the prolonged heats.

RM SEMISILICA BRICKS are made for this service. The picture at the right shows the results of 24 hours at 2650° F. on a First Quality Clay Brick and the almost unaffected RM.

LONG DURATIONS OF HEAT

Furnaces, intended to be run continuously can safely be lined with RM SEMISILICA BRICKS, provided the face temperature of the lining is below 2700° F. While silica bricks are ideal for continuous heats, a furnace may have to be shut down, which is hard on Silica Bricks, but RM SEMISILICA BRICKS take it easily.

Note. Some slags and gases attack refractories, so if in doubt, please ask or write for recommendation for your furnaces.



Compression, vitrification and spalling of First Quality Clay Brick, and relatively unaffected RM Semisilica brick after a run of 24 hours under heat and load.

In STEEL MILLS:

For Heating, Reheating, Annealing and Heat Treating Furnaces, OH Regenerators, Blast Furnace Stoves, Soaking Pits, etc. In the roofs, where spalling failure is most prevalent, they perform their greatest service.

In MANY INDUSTRIES:

Such as Chemical, Ceramic, Zinc Smelting and other industries where continuous heats in the temperature range of RM's are required for their processes.

RICHARD C. REMMEY SON CO.

PHILADELPHIA 37, PA.

REMMEY

Controls on Copper And Copper Alloys Lifted for 17 Items

Washington

• • • **Through an amendment** to Conservation Order M-9-c, WPB last week removed restrictions on the use of copper and copper base alloy in the manufacture of 17 civilian and commercial items and announced that permission will be granted to manufacture copper base alloy sheet, roll, strip and rod for building construction, for repair and replacement purposes and to fill United States military contracts.

The 17 items that now may be made from copper and copper base alloy as the result of removal restrictions are:

Supply and return water lines for radiators for passenger carriers having a seating capacity of not less than 11 persons; brazing rod for motorcycles and motor-driven power cycles; plating of lighting fixtures; solder bushings and plumbing installations; door knockers, checks, pulls and stops for passenger transportation equipment, for repair and replacement purposes; carbonators for beverage dispensing units and soda fountain equipment; engraved burning branding dies; watch cases; metal sponges for use in dairy product processing plants and by the canning industry; gears for can openers; gears and bushings for egg beaters; adjustable stencils; M-4 jackets for the United States Navy; snap fasteners for nurses uniforms.

Truck Production Off From Scheduled Output

Detroit

• • • **Truck production during** the first nine months of 1944, according to word from WPB, totaled approximately 554,000 units, off 5.5 per cent from scheduled output of 586,000 jobs.

Heavy truck production suffered the most. Against a program of 205,000 light-heavy trucks during the three quarters, only 187,000 were produced; and against 44,000 scheduled in the heavy-heavy classification, actual output was 44,000. Labor shortages in gray iron and malleable iron foundries and in assembly plants were declared responsible.

Built to exceed—not merely meet—
"G I" specifications

HOUGHTON'S RUST PREVENTIVES

No better proof of that claim could be supplied than the instance of a special rust preventive for ball and roller bearings.

The first specification was P.S. 500, dated September 20, 1943. To meet and beat that "spec" we developed Cosmoline 955, which was approved. On August 1, 1944, after industry conferences, a new specification was issued (AN-C-124) which was even more exacting as to protection, volatile content and oxidation stability.

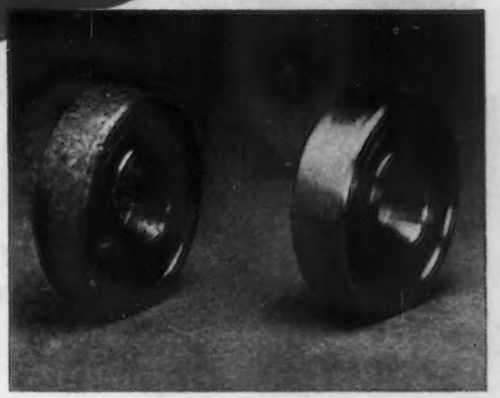
Our Cosmoline 955 met that, too, which is the point already stressed: that in using the maximum of the "spec" as our minimum, we are assuring an extra margin of safety in this fight against rust. Rust preventives are intricate, chemically-made products today compared to straight oils or even the inhibited products of pre-war days. They have to do a much tougher protective job than domestic needs formerly prescribed.

Take AN-VV-C-576a, which covers an additive for aircraft lubricating oil, so engines may be used for flying up to 50% rated capacity, with the rust preventive added 1 to 3 to the oil. The "fly-away" test is severe, but Houghton's Cosmoline 900A meets it. Other tests which that product has met—and exceeded—include minimum carbon residue, color, corrosion prevention, 100-hour oil endurance test, Viscosity Index, flash, pour point and viscosity.

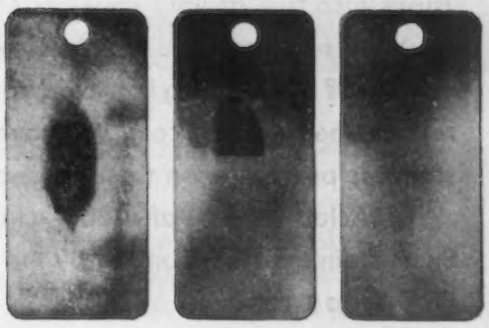
A third chemically-based product is Houghton's Cosmoline Fingerprint Neutralizer. This product actually serves four purposes: cleansing, water displacement, neutralizing of perspiration acid stains and rust prevention. Yet its film is only .003″ thick.

That is not as thin as the polar-type film provided by Cosmoline Brilco Grade III approved for Bureau of Ships Spec. 52C18, Grade III. That product must leave a film *less than* .0003″ thick, yet provide protection against rust in a four months' shed exposure test, and pass special water displacement and heat resistance tests.

So it may be seen that to make a rust preventive that really prevents rust today, requires a knowledge based on experience and ability. Houghton qualifies—can supply preventives to meet practically all standard "specs"—and is at your service on corrosion problems. Write for most recent (October) revision of "Digest of Corrosion Preventive Specifications." It's helpful.



One rusted, one didn't, after 100% relative humidity test lasting 1 month. Read why.



Three plates fingerprinted. Left—dipped in kerosene; center, half submerged in Fingerprint Neutralizer; right, completely immersed—fingerprint gone.

Left, uninhibited grease; right, Cosmoline 2-82C. Both exposed to 100% humidity @ 100° F. for 30 days.

E. F. HOUGHTON & CO.
303 W. Lehigh Avenue, Philadelphia 33, Pa.

How Thick

should an Elephant's Hide be?

Thick enough to withstand the attacks of its enemies . . .

That's also true of your stainless equipment . . . Why pay for more stainless metal than you need? . . . By using IngAclad you greatly reduce the material cost, yet have perfect stainless protection on the exposed surface . . . IngAclad consists of a 20% cladding of finest stainless steel bonded by the Ingersoll Process to a backing of mild steel.

If you are considering modernizing your plant with stainless equipment, be sure to investigate IngAclad . . . the only Stainless-Clad material with a 12-year record of satisfactory service in continuous use.

Users of IngAclad include:

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Groen Mfg. Co.
Leader Iron Works
Monsanto Chemical Co.
Procter & Gamble Co.
Sherwin-Williams Co.
Solvay Process Co.
United States Potash Co.
Whiting Corp.
and many others

Write for Special IngAclad Folder and Manual of Fabricating and Welding Procedure

INGERSOLL STEEL & DISC DIVISION
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Plants: Chicago, Ill.; New Castle, Ind., Kalamazoo, Mich.

Also Producers of Ingersoll Solid Stainless and Heat-Resisting Steels

An Appraisal of Precision Thread Rolling Practice

(CONTINUED FROM PAGE 55)

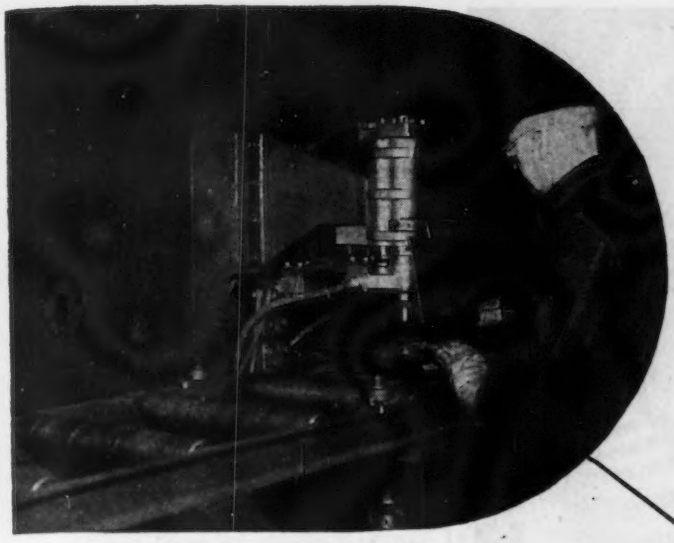
pressure on hollow work can be held to a minimum to prevent distortion. Besides, three point contact is more favorable than two point contact from this point of view. Circular dies for taper threads such as on lead-in threads on aircraft studs or for interference fits are made with the required tapered bulge in the middle of the die roll since the dies can be turned end for end to double their life.

More recently a two roll threading machine of German origin has appeared on the market. It is made by the Watson-Flagg Machine Co., Paterson, N. J., and is sold through W. A. Schuyler Co., New York. As can be seen in Fig. 13, the two rolls are rotated by power on horizontal axes and the work is supported on a rest bar between them much the same as in a centerless grinder. The rolls are approximately 6 in. in diameter, the exact size being a multiple of the pitch diameter of the thread being rolled. Infeed of one roll is by a hydraulic piston, the depth being governed by a microswitch with micrometer adjustment.

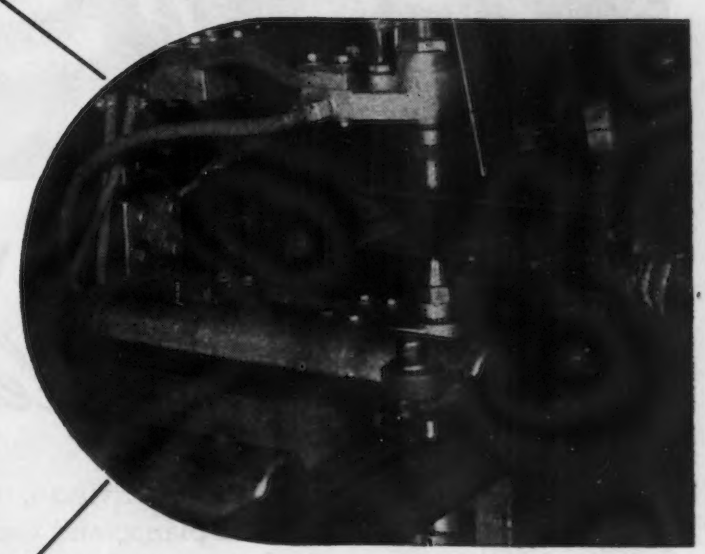
The micrometer reads in thousandths but through a three to one lever system the microswitch setting is that much closer, so that by estimating, the setting can be read approximately to "tenths."

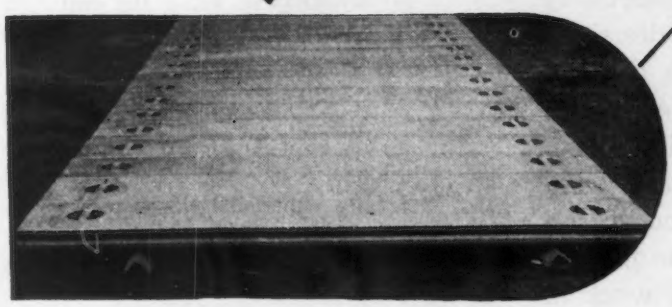
As has been indicated, matching of dies on the improved type Reed machine is obtained by rotating two of the circular dies with respect to the third, which is fixed, whereas in the Watson Flagg circular die machine it is only necessary to rotate one die roll with respect to the other. Since the control is through a worm and wheel drive with a 16:1 ratio, very fine angular adjustments are available.

The Watson-Flagg machine is perhaps the simplest of all to set up but like all the other machines, matching of dies is by cut and try methods. While some threaded products can be completed in one revolution of the die, or less, in the case of extremely hard parts (up to Rockwell 40C), it is possible to rotate the dies as many as 15 revolutions, resulting in an extremely fine penetration per rotation of the blank and giving the equivalent action of a straight die over 22 ft. long.



Conveyorized Spot Welding with a PWC Pedestal Welder





Top: Steel hatch cover sections for ships having Z-bar reinforcements welded into them while passing down a conveyer. The Machine is a modified Standard PWC 100 KVA Welder.

Center: Top and bottom Z-bar flanges are welded simultaneously, the current going through the Z-bar. The welder is equipped with upper and lower guns. Machine compensates for current losses.

Bottom: It takes sixteen sections to make a unit and three units to make a hatch cover. The design and process saves many pounds and makes it simple for only 2 men to open and close a hatch.

Not so long ago, many people would have said that a job like this was "impossible": series welding a Z-bar of #11 gage steel into a box of #14 gage. Twelve spot welds are made on each Z-bar. Production averaged approximately 75 to 80 sections per hour (30 secs. per section at peak production). Material was fairly scaly hot-rolled steel.

To do this job, a PWC Pedestal welder equipped with lower as well as upper gun was built right into the conveyer line. The machine like other PWC equipment is designed for ready conversion for post-war production requirements.

For the complete story on this operation ask for Welding Pictorial #37.

For further information on the PWC line of standard Pedestal welders ask for Bulletin #502.

PROGRESSIVE WELDER CO.

SEAM PROJECTION & BUTT • *Electric Welding Equipment* • PORTABLE GUN & PEDESTAL

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FEATURE CONTINUATIONS

Although the machine will ordinarily roll threads at the rate of 15 ends per min. the action is much slower on large work on tough alloy steels. A 1-in. bolt made of SAE 4140 chrome molybdenum steel, for example, with an 8-pitch thread heat treated to 38 Rc has been rolled experimentally in 7 sec. The die is rotated 15 revolutions.

On the Watson-Flagg machine because contact is only at two points on the blank, it is necessary to support hollow parts on a mandrel unless the wall is fairly heavy. A feature of this machine and also of the National Electric Welding Machines unit is that the hydrostatic pressure in the system can be preset. The infeed will therefore accommodate itself to the hardness and hence the rollability of the bolt or stud material. The dies will continue to revolve and dig in until the microswitch is contacted, at which point the movable die will be retracted automatically.

Although in appearance this unit resembles a centerless grinder, the support of the work is quite different. Instead of being above center as in the grinding operation, when the thread is finally rolled to depth, the center of the blank should be approximately 0.003 in. below the centerline between the two dies. The rest bar is obviously subject to some wear since the crests of the threads are not entirely smooth. The best material for the rest bar has been found to be a nickel tool steel that is nitrided to a high superficial surface hardness. The hardest grade of cemented carbide has not worked out nearly as well.

In connection with the factor of hydrostatic pressure in the system, it has been found that for aluminum and stainless steel, more pressure and a shorter rolling course (partial or whole die revolution) works out best. For heat treated aircraft steels of high hardness, on the other hand, higher pressures must be employed and the rolling course becomes longer due to the resistance of the work to deformation. On hollow parts, obviously the pressure should be reduced to prevent distortion of the work to an ellipsoidal form.

In next week's article, die design factors will be discussed as well as the performance characteristics of the several grades of tool steel currently used for thread rolling dies.

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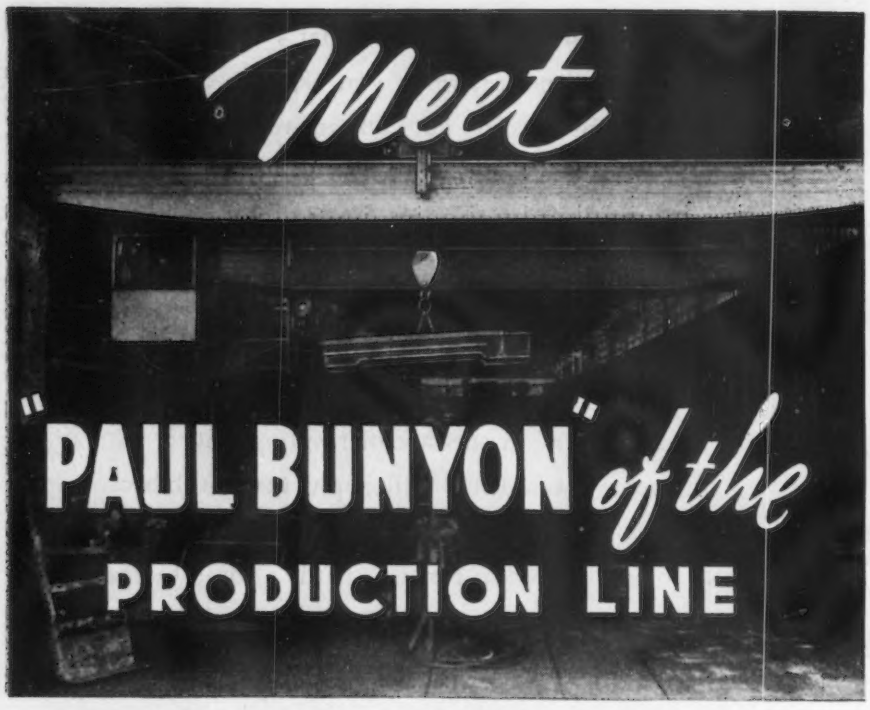

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Tremendous accomplishments, such as single-handedly digging the Grand Canyon, which have been credited to the mythical character "Paul Bunyon" and "Babe" his giant blue ox, may have been far-fetched.

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FEATURE CONTINUATIONS

Tank Production In The Soviet East

(CONTINUED FROM PAGE 66)

Leningrad scientists developed a 100 kw. water-cooled high-frequency transformer weighing only 250 lb. Heat treatment of a cylinder casing formerly took 30 hr. Now it is done in 37 sec. Cams which were once made of chrome-nickel steel are now made of simple carbon steel, hardened by electro-magnetic treatment. The total economy effected by introduction of the electric hardening process has been 25 million rubles a year. On the whole during 1943 the Ural plant produced 39 per cent more tanks and 50 per cent more diesel engines than in 1942. Production is well ahead of schedule.

The details of Russian tanks are more or less standardized, making for interchangeable parts. This not only simplifies the process of design and manufacture, but facilitates repair of damaged tanks on the battlefield. Standardization is also evident in the latest Russian self-propelled weapons, the new field gun-carriers mounted on the convertible KV and T-34 chasses, from which the tank body can be removed.

Short Peening and The Fatigue of Metals

(CONTINUED FROM PAGE 67)

limit. On account of the impossibility of comparing length of life of two metals for applied stresses below the endurance limit of either one of them, the comparison of stresses for a given life is to be preferred to the comparison of life for a given applied stress. There are, however, many cases in which length of endurance for satisfactory service is a more convenient basis for evaluating resistance to fatigue than is applied stress (or load, which is assumed to be proportional to applied stress). An examination of the *S-N* diagrams shown in Fig. 4 shows that a small percentage increase in applied stress (or load) means a much larger percentage decrease in length of service before fracture. Examination of many hundreds of *S-N* diagrams shows that there is a considerable amount of "scatter" of results even in carefully conducted fatigue tests. This means that whether applied stress (or load) or length of life before probable fracture is used as the basis of computation by the designer of machine parts, a factor of safety (better

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Electrode Size	Cost per Pound
1/8"	$2.56
5/32"	2.05
3/16"	1.72
1/4"	.99
5/16"	.74
3/8"	.55

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called a factor of uncertainty) must be used.

If it is desired to design a machine part on the basis of a satisfactory length of service before fracture the designer should use for his computation a life many times (10 to 20) the desired length of satisfactory service. On the other hand, if the applied stress (or load) for the desired length of satisfactory service is used, the reduction factor for that applied stress, based on the endurance limit for a satisfactory life, after allowance has been made for stress raisers, residual stresses, size of part, range of applied stress during a cycle, size of piece and any other factors which may be judged to affect fatigue strength—this reduction factor then may be much smaller (1.5 to 3).

Results of Fatigue Tests

Table II summarizes results of comparative fatigue strength of peened and unpeened specimens of various metals. The table is based on the applied stress for a life of 10,000,000 cycles of stress. For most steels this stress may be regarded as the endurance limit for indefinitely long life; for the phosphor bronze specimens the endurance limit listed in Table II is probably somewhat higher than the endurance limit for indefinitely long life.

From Table II a comparison can be made of the tests in which the unpeened specimens were polished with the tests in which the unpeened specimens were *not* polished. The percentage gain in strength due to peening is naturally greater for those tests in which the unpeened specimens were not polished, but left with their "as received" surface finish.

In two cases the fatigue strength of the polished, unpeened specimens was higher than that of the peened specimens, the percentages being 3 and 7 per cent respectively.

An examination of the detailed reports of these two tests indicates that in the case of the SAE 1045 steel, water quenched and drawn, the heat treatment might have set up residual stresses which acted to counteract the strengthening effect of the peening. In the case of the SAE 9260 steel, while the fatigue strength at 10,000,000 cycles is very slightly less for the peened specimens than for the polished, for applied stresses above the endurance limit for 10,000,000 cycles, the strength of the peened specimens for a given number of cycles of stress was greater than that of the polished specimens. In this connection the results reported by Horger and Neifert [Ref. 8] are of interest. Those results show that, for plain specimens with no sharp fillet, peening with No. 22 shot gave better results than peening with a smaller shot, No. 28, or with a larger shot, No. 19. It seems probable that the comparative effect of peening depends on the proper choice of size of shot, velocity of striking, and time of exposure to the rain of shot, in other words on choice of the proper intensity of peening for a given machine or structural part.

While the available test data are too few for any final conclusion, in general, they indicate that, by using proper methods of shot peening, the fatigue strength of peened steel may be made somewhat greater than the fatigue strength of the same steel polished but not peened. In many cases shot peening is a more rapid and less expensive surface finish than is polishing.

In heat treating steel a thin surface layer is not infrequently decarburized, and thus a weakening of the metal takes place at the surface, where the most damage can be done to resistance to bending and twisting strength. It seems probable that shot peening can be used to offset, at least partially, the weakening due to any such decarburization. [Ref. 4].

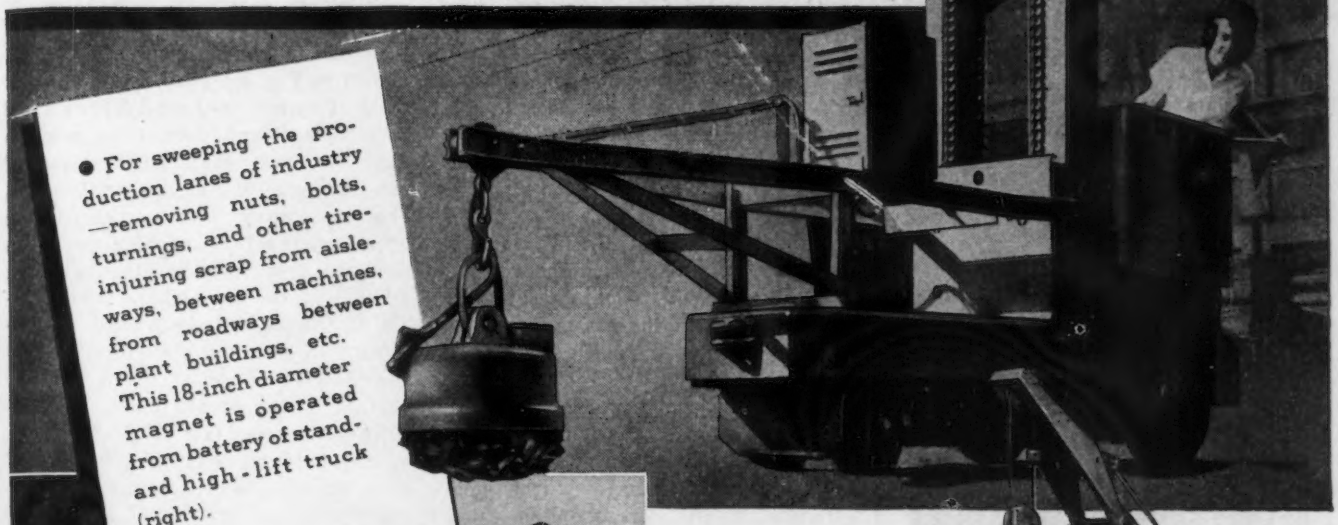
Life Length Comparisons

Comparisons of length of life under a given cycle of repeated stress cannot be made on a percentage basis alone since the percentage of gain of life due to peening increases rapidly as the magnitude of stress is decreased. Moreover, this percentage cannot be computed for stresses below the endurance limit of the unpeened metal. Values of percentage increase in life in actual service have been reported for springs and automobile parts, and the increase of life due to shot peening ranges from three to 20 times.

It is equally true that comparisons of fatigue strength cannot be made on the basis of applied stress (or load) for only one length of life, since many structural and machine parts are designed to withstand only a limited number of cycles of stress. For a satisfactory comparison of the relative fatigue strengths of two metals, of peened and unpeened metals, or of machine parts made of different metals, an S-N or a Load-N diagram should be available up to several times the number of cycles to be expected

Getting Things Done Quickly...

FLOOR-SWEEPING — MATERIAL-HANDLING — ROAD-SWEEPING OPERATIONS WITH EC&M MAGNETS



● For sweeping the production lanes of industry—removing nuts, bolts, turnings, and other tire-injuring scrap from aisle-ways, between machines, from roadways between plant buildings, etc. This 18-inch diameter magnet is operated from battery of standard high-lift truck (right).

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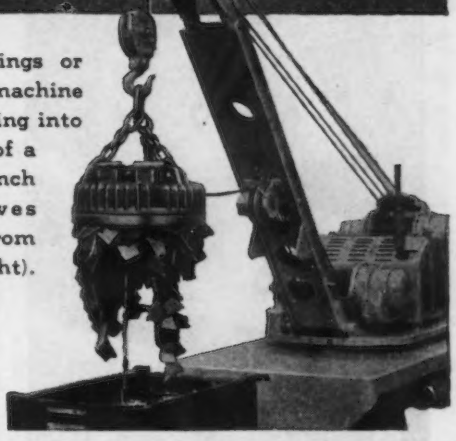
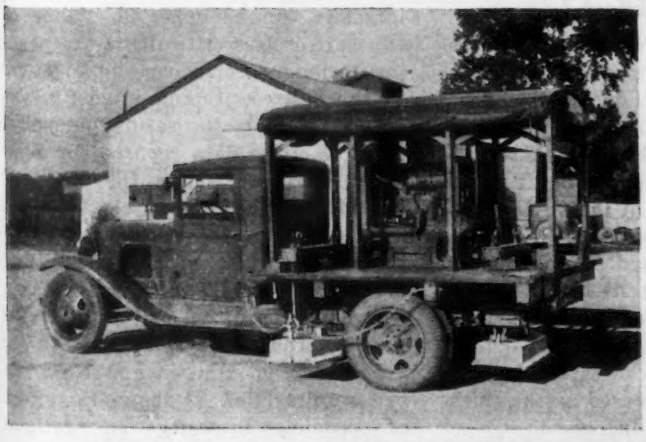


For lifting castings or forgings onto machine tool beds—reaching into remote corners of a plant, this 29-inch magnet receives power directly from crane truck (right).

Where large tonnages are handled, the EC&M No. 6D, 65-inch diameter magnet is available. Especially suited for open hearth stockyards—for shipboard use to reduce handling time in ports. EC&M Circular Magnets come in 10 sizes for all industrial needs. Bulletin 900 gives complete data and shows many interesting installations. Bulletin 910-2M gives road-sweeping magnet information. Ask for your copies to-day.



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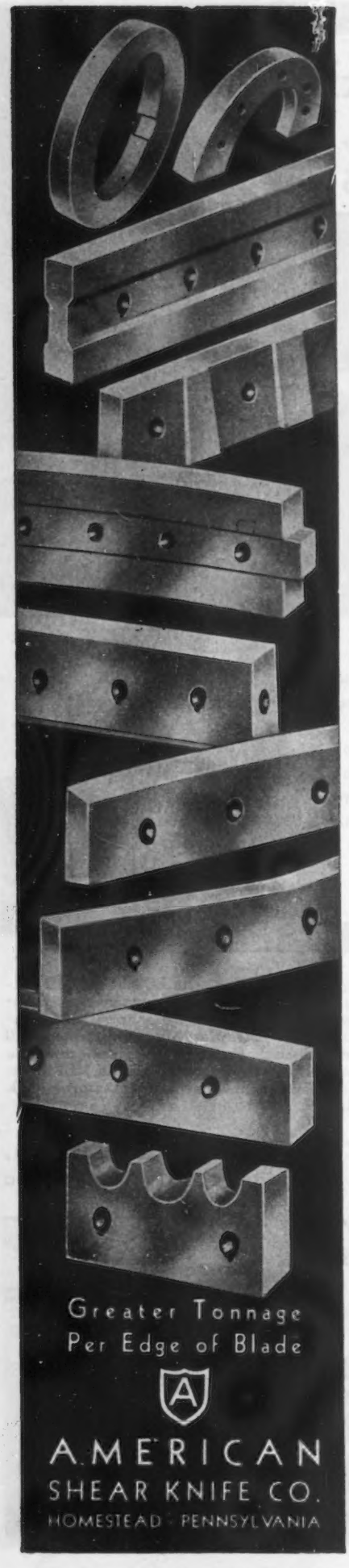

in a satisfactory length of service for the part.

Shot peening has been successfully used at fillets and grooves to offset the stress concentration at the fillet or groove. Shot peening is especially effective in cases in which the shaft or other part is not polished or cannot keep a polished surface. In shot peening grooves and notches (such as screw threads) it is obviously necessary to use shot smaller in diameter than the diameter of the rounded bottom of the groove or notch.

If a machine part is to be subjected to repeated cycles of direct axial tension and/or compression, shot peening is less effective in increasing its fatigue strength than is the case for a part subjected to repeated cycles of bending or of torsion. In a piece subjected to axial tension or compression, up to the yield strength of the core, the bulk of the load must be carried by the unpeened core. At the yield strength of the core yielding takes place without much additional stress being taken by the core, although some of the stress is transferred from core to peened skin, which has a higher yield strength than the core.

In a machine part under bending or torsion the stress varies from zero at the center of gravity of the cross-section to a maximum at the surface. Then the peened skin of the piece resists a larger proportion of the bending moment than does an equal area of metal in the core, and adds a larger percentage to the strength of the piece than that added by the peened skin of the piece in direct axial tension or compression. The peened metal adds strength just where it will do the most good.

Size Effect

It seems probable that for pieces to resist flexure or torsion the increase of fatigue strength due to shot peening will be some function of the ratio of thickness of shot-peened skin to thickness of the piece. (See Fig. 5). It cannot be stated at the present time that the piece shown at *C* will resist just as high repeated stresses as will the piece shown at *A*, but there will be a tendency to equalize resistance to repeated flexural or torsional stresses if the thickness of the shot peened skin is increased as the thickness of the piece is increased.

Intensity of shot peening depends on the size of shot, material of shot, striking velocity of shot and length of exposure of the peened surface to the rain of shot. At present no quantitative rules for assigning values to these factors so as to produce optimum results of peening can be given. It seems reasonable to assume that for deep penetration of peening larger shot should be used than for shallow penetration.

A useful device for measuring intensity and securing uniformity of peening is the Almen strip gage, shown in Fig. 6. [Ref. 9] A thin flat strip of rather hard steel *S* is clamped to a base *B* and peened for a given time with the same combination of size, material and striking velocity of shot as is to be used in the peening of a structural or machine part. In fact the test strip is attached to a dummy of the same shape and material as the pieces to be peened. The intensity of peening, therefore, is representative of that given to the surface of the peened part. A time-intensity curve (see Fig. 7) for a batch of pieces may then be plotted from the results of tests made in this manner.

Fig. 7 shows two diagrams drawn with values of peening intensity as ordinates and time of exposure to shot (or quantity of shot) as abscissas. The desired intensity of peening, determined by the experience and judgment of the operator, is shown as *OP*. The curve marked *A* was obtained by using a given size, material and striking velocity of shot for various intervals of time, while the curve marked *B* was obtained by varying one or more of the above factors and making peening intensity determinations for various intervals of time.

The time of exposure for securing the desired intensity of peening is quite critical for the peening technique corresponding to curve *A*, and a relatively large variation in peening intensity can be expected. Time of exposure is less critical for the peening technique corresponding to curve *B*, the desired peening intensity was reached close to the saturation point.

Fig. 8, from data reported by Zimmerli [Ref. 4], shows the effect of time of exposure on fatigue strength, determined on the basis of applied stress for a life of several million cycles of stress. This diagram has a shape similar to that of the intensity-time diagrams shown in Fig. 7.

Fig. 9 from Horger and Neifert's test results [Ref. 8] shows the effect of peening intensity on fatigue strength. For the plain specimens tested the maximum fatigue strength was obtained with a peening intensity indicated by an arc height of 0.0065 in. on an Almen "C" strip. However, for specimens with fillets the fatigue

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Review of Effects

It seems that peening beyond a certain intensity weakens the resistance of a part to repeated stress. Probably this effect of over-peening is due to cracks started in the peened surface of the metal, or just below the peened skin.

Shot peening does not directly affect the chemical attack of moisture on steel. However, the surface of shot-peened metal is under residual compressive stress and before corrosion pits can form and start a fatigue failure, this peened and compressed skin resists cracking and delays, if it does not inhibit, the formation of the corrosion pits, which are the cause or the nuclei for possible spreading cracks. In this matter of corrosion, much more research work needs to be done. However, experience has shown that shot-peened steel is distinctly more resistant to destructive corrosion than unpeened steel of the same chemical composition.

Much has yet to be learned about the details of the peening process before any very definite rules can be laid down for securing optimum results for a given machine part. The thickness of the shot peened skin on a machine or structural part is probably not over 0.01 in. for small pieces, although it may be somewhat larger for large pieces peened with large shot with a high striking velocity. This means that shot peening cannot be expected to be so effective in increasing the fatigue strength of thick pieces as it has been found to be in the case of thin pieces. If there are cracks or seams in the base metal peening may not be effective.

Shot peening can be applied to irregular shapes in which heat-treating processes might cause excessive distortion and in which rolling or drawing processes are not feasible. It can be applied to finished parts, such as springs, or to specific areas on structural and machine parts, as to the fillet of a shaft to offset stress concentration. It can be applied to parts such as gear teeth without causing appreciable distortion, while it produces a surface with improved resistance to pitting corrosion under localized heavy stress at bearing points, and also with improved resistance to wear. Often shot peening can be used as a surface finish in place of polishing, with actual gain in fatigue strength. Such a substitution of shot peening for polishing often reduces production costs materially.

While shot peening needs much more research and study before its limitations and advantages can be finally evaluated, it has already proved its worth in strengthening many machine parts, some large and some small, some made of iron or steel and some of non-ferrous metal, some of hard metal and some of soft metal. In some cases it has replaced polishing. It is being used with apparent success to increase resistance to surface damage, such as light bruises, "fretting corrosion," pitting corrosion and decarburization. It seems certain that the field of usefulness of shot peening will be much enlarged in the near future.

Acknowledgments

The writer thanks the Society for Experimental Stress Analysis, who kindly gave permission to use data presented before their 1944 spring meeting in Boston. Thanks are also given to the American Society for Testing Materials who gave permission to use unpublished data in the files of the Research Committee on Fatigue of Metals. Acknowledgment is made to O. J. Horger and H. R. Neifert of the Timken Research Laboratories for valuable data on the fatigue strength of shot-peened specimens, and to R. E. Peterson of the Westinghouse Research Laboratories for data furnished, and for recalling other data to the writer's memory. Especial acknowledgment is made to J. O. Almen of the General Motors Research Laboratories, who made many valuable suggestions and criticisms.

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ROLLING STOCK WRECKAGE — *R.A.F. bombers wrought great devastation in the railway yards at Varies, France. During one of the attacks this truck was flung into the air where it remains upright without any support.*

o o o

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MACHINE TOOLS

Some Machine Tools to Be Expendable

Cleveland

• • • Machine tool moguls blinked and read a second time the statement by F. E. Brickel, local chief of RFC's Surplus War Property Division, that "we have seven purchasers for every standard machine tool we can put on sale."

Declaring that postwar planning was responsible for most of the rush, and that new military orders had put additional manufacturers on the market, Mr. Brickel indicated that special purpose machine tools, making up a large part of the government-owned surplus, may eventually be considered an expendable item.

"Generally," said Mr. Brickel, "lessees are doing most of the buying, and right now it seems that disposal (machine tool) will not be nearly so big a problem as was originally anticipated." No figures on the current turnover were forthcoming, however.

According to Mr. Brickel, no plants owned by the DPC in Cleveland are for sale at the present time, but an estimated 60 per cent of the lessees here are interested in buying the property they are using—to which machine tool men said . . . "nuts."

A recent sale of DPC machinery brought 62 per cent of its original cost, but one dealer here in town stated flatly that he would not be interested in buying DPC equipment at even 30 per cent of its original cost, much less the prevailing price of 45 per cent.

In some 40 large DPC facilities in this area, it was estimated by a reliable source that sales of machine tools to lessees would average about 25 per cent. This takes into account that some contractors will buy nothing and a few will have use for everything on hand. Elsewhere, a company now using over 60,000 DPC machines has estimated that its postwar operations will require less than 10 per cent of them.

With the current government-owned surplus estimated at well over 500,000 machine tools, representing about 10 good years' output for the entire industry, alert machine tool makers are looking hopefully toward postwar China as a natural outlet for the surfeit.

Anticipating that military orders will drop off to nothing next year, the industry here has already accepted a good deal of postwar business and is feeling the effect of the automobile manufacturers' initial effort to get set for the halcyon days ahead.

With few exceptions tool and die shops are accepting postwar orders and have plenty of things on the drafting boards. Jig and fixture makers generally seem to be starting the slow turn around the corner. Supporting this in part is the fact that last week at least one good sized military order was going begging. Delivery on current military orders are running about two months. Rumor has it that the war's end will unveil a startling machine tool picture, since there are warehouses said to be full, or nearly full, of equipment never removed from its original skids. One Government arsenal, for example, didn't begin digging into its reserve machinery until we had been at war for more than a year. One company is still waiting for the Army to pick up some special machines, long since packed away in grease.

•

October Improvement Modest

Cincinnati

• • • A modest improvement in October bookings as contrasted to September is noted in the district machine tool market. Of course, this is not in the hysterical proportion of 18 months ago but on a satisfactory level. The greater portion is reported for domestic shipment, although prospects of further lend-lease business in the near future is reported. Labor continues tighter each week with some plants indicating losses of workers heavier than new employment. While production is being hurt by this trend, builders are expanding subcontracting programs whenever possible.

Ashtabula Plant Planned

Cleveland

• • • While no official announcement has been forthcoming, authoritative sources say that the General Electric Co. will construct a new plant, to house a new refrigeration unit and employ about 3000 workers at Ashtabula, Ohio. Involving an investment of $5,000,000, the projected plant will almost double Ashtabula's employment.

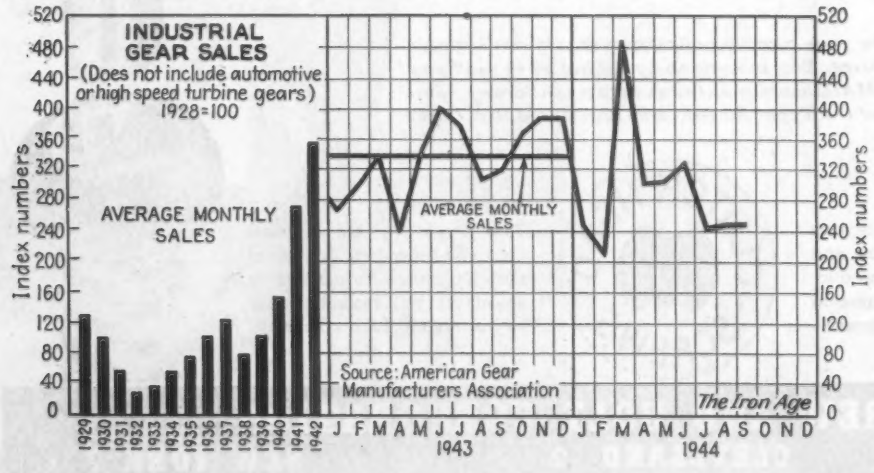
Termination Order Issued

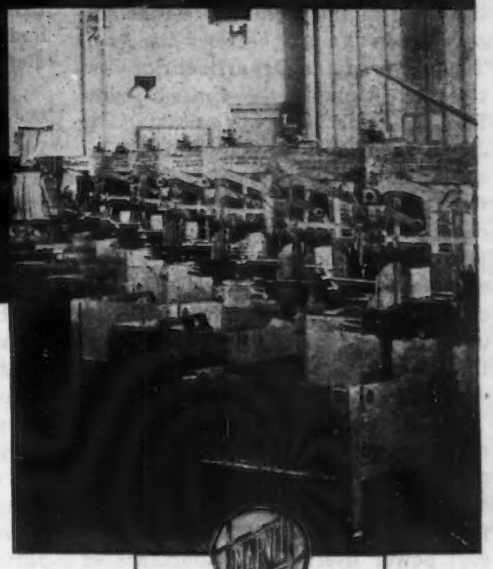
Washington

• • • The Joint Army-Navy Termination Regulation has been published recently. This regulation takes the place of the War Department's PR 15 and the Navy Department's Regulation 7. Copies will be made available to industry.

September Gear Sales Increase

. . . The gearing industry, as represented by the members of the American Gear Manufacturers Association, shows an increase in volume of sales for September, as compared with August, of .3 per cent. This report does not include turbine or propulsion gearing. The index figures for September was 248.





Where Speed Counts Most!

Increased steel production and more rigid inspection during the war has made it necessary for metallurgical laboratories to require hack saw machinery for specimen cutting of a wide variety of metals and alloys of almost any shape or size—in any condition of hardness.

The photos shown here illustrate how one large steel mill in the middle west has installed a battery of Marvel Hack Sawing Machines to crop and cut-off slices for metallurgical tests of large billets of tough alloy steels. This company, along with many other steel companies, has found that the Marvel Machine is the only one capable of cutting the hardest alloys fast and economically. The Marvel is the most universal cutting-off machine, built for heavy duty, continuous operation.

Marvel Saws increase production by rapidly, accurately and economically cutting-off the toughest steels in cross sections up to 24" x 24". If you have metal sawing problems, Marvel Sawing engineers are available to discuss and analyze your cut-off work—to recommend methods and equipment.

ARMSTRONG-BLUM MFG. CO

"The Hack Saw People"

5700 W. BLOOMINGDALE AVE. CHICAGO 39, U.S.A.

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL SAWS

NON-FERROUS METALS

. . . News and Market Activities

Alcoa May Not Wish to Buy Three Anti-Trust Division Barred Plants

Pittsburgh

• • • The recent reports of the Department of Justice barring the Aluminum Co. of America from purchasing the aluminum plants at Queens, N. Y., Burlington, N. J., and Riverbank, Calif., appear to be the opening guns in the legal battle that will come up in January between the Anti-Trust Div. of the Department of Justice and Alcoa in the United States District Court in New York. The Justice Department has stated that approval will be withheld from Alcoa for the purchase of these plants because such a purchase would contribute to a monopoly in the aluminum field. Yet a New York district court of appeals in 1942 rendered an opinion by Justice Francis G. Caffey, that Alcoa did not constitute a monopoly.

The Aluminum Co. of America might lack interest in these particular plants because all are high cost producers. The two in the East are steam powered, while Riverbank is a high cost power user. The importance of this action is that it might serve as the basis for future actions on projects of greater interest to Alcoa.

While Congressional approval is necessary before any of these units can be sold as surplus, the DPC contract with the company did not specify that Alcoa would have first pick of the plants they operated. The contract was only an operating contract and when the time had arrived for disposal of these plants, Alcoa was to have been able to obtain them on the same basis as any other interested party. This provision is slightly different from that of other war expansion plants where the operating company is given first opportunity to refuse a purchase of the DPC plant or equipment.

The Justice Department is reported to have written the RFC that it regards Alcoa as a monopoly and would refuse permission to Alcoa to purchase the plants it has been operating. Company officials refuse to comment on the matter, but some officials of the company feel that by barring Alcoa from these plant purchases the Department of Justice's Anti-Trust Div. might well be stepping beyond its legal jurisdiction.

Aluminum Spot Authorizations

New York

• • • Out of the nearly 7 million lb. of aluminum authorized for consumption under the WPB spot authorization plan up to the middle of October, all but 125,000 lb. have been earmarked for the production of consumers' durable goods. This authorization of controlled material under WPB order PR-25 embraces consumption by fabricators for the period from the last quarter of 1944 through the third quarter of 1945.

As might be expected, the largest single item authorized was household aluminum ware, pots, pans and other kitchen utensils which will consume during that period nearly 6,380,000 lb. and represent 89 approved applications to WPB under the plan. Other categories of consumers' durable goods authorized include metal household furniture, 233,500 lb.; vacuum cleaners, 111,134 lb.; electric irons 78,000 lb.; electric ranges and heating appliances, 23,450 lb.; metal office furniture, 14,500 lb. and hand and powered lawn mowers, 5,900 lb. Photo equipment and accessories will take 6094 lb.; musical instruments, 1510 lb.; and 1000 lb. each for cutlery and plated silverware.

Plumbing and heating equipment will be the next largest consumer of aluminum during the period with a total of 66,875 lb. in 66 applications. Domestic water heaters will take 32,138 lb.; fittings and trim for plumbing fixtures will get 25,000 lb.; and sanitary plumbing ware, 3500 lb.; heating specialties, 5000 lb.; coal stokers. 2250 lb.; non-electric ranges, 3511 lb.

Loose leaf binders and parts will take 16,250 lb. The automotive industry will use 4400 lb. for replacement parts and maintenance equipment. Sheet metal for buildings will require 3000 lb. Floor finishing machines, 10,650 lb.; typewriters, 7600 lb.; commercial refrigerating equipment for air conditioning, 4508 lb.; nailed wooden boxes and crates, 5100 lb.; dairy and milk products machinery, 2525 lb. Smaller quantities are authorized for farm machinery, agricultural machinery—wagons, etc., metal signs, laundry and dry cleaners' equipment, beauty shop equipment, and scales and balances.

Scrap Metals

• • • Aluminum scrap is firmer this week in the Eastern market with high grade alloys increasing by ½c. per lb. This is doubtless the first evidence of the effect upon the market of the new floors established by the government for its surplus metal stocks. Copper and brass scrap is now flowing freely but prices are still firm. In Chicago, non-ferrous scrap buying continues cautious with little apparent tendency toward strengthening in prices. Aluminum scrap has apparently found little support in Chicago from the recent government price policy on surplus stocks. Despite easiness, red metal prices appear to be maintained.

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Antimony

• • • Demand for antimony continues and our treatment of Mexican ore at the Texas Mining and Smelting Co. plant at Laredo, Texas, has not recently been able to supply our requirements. Therefore government stocks have been drawn upon. It is said that these stocks now approximate 10,000 tons of antimony metal and 5000 tons of antimony in the form of ore.

•

Ottawa

• • • Announcement is made that Granby Consolidated Mining, Smelting & Power Co. Ltd., Copper Mountain, B. C., has secured a renewal to Dec. 31 of its contract with U. S. Commercial Co., Washington, for the sale of copper concentrate. Arrangements beyond this period will depend on the general copper picture and operating conditions.

Primary Metals

(Cents per lb. unless otherwise noted)

Aluminum, 99+%, del'd. (Min. 10,000 lb.)	15.00
Antimony, American, Laredo, Tex.	14.50
Beryllium copper, 3.75-4.25% Be; dollars per lb. contained Be	$17.00
Cadmium, del'd.	90.00
Cobalt, 97-99% (per lb.)	$1.50 to $1.57
Copper, electro. Conn. valley	12.00
Copper, electro. New York	11.75
Copper, lake	12.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.5%, dollars per troy oz.	$4.50
Iridium, dollars per troy oz.	$165.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9+%, carlots	20.50
Magnesium, 12-in. sticks, carlots	27.50
Mercury, dollars per 76-lb. flask, f.o.b. New York	$108 to $110.00
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per oz.	$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.67

Remelted Metals

(Cents per lb. unless otherwise noted)

Aluminum, No. 12 Fdy. (No. 2)	8.50 to 9.00
Aluminum, deoxidizing Nos. 2, 3, 4	6.25 to 9.00
Brass Ingot	
85-5-5-5 (No. 115)	13.25
88-10-2 (No. 215)	16.75
80-10-10 (No. 305)	16.00
No. 1 Yellow (No. 405)	10.25

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.87	....	20.37
Copper, H.R.	....	17.37	....
Copper drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....	....	19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercial bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	28.00
Phos. bronze, A, B, 5%	....	36.50	36.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	....

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier: 2S and 3S, 21.2c.; 52S, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness: 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base, 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 28c.; 53S, factor No. 1 to 4, 28½c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals: ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 34c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

NON-FERROUS SCRAP METAL QUOTATIONS

†*(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums—other prices are current quotations)*

Copper, Copper Base Alloys

OPA Group 1†

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	8.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2†

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (Phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Contaminated gilded metal solids	8.50
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25
Automobile radiators	7.00
Zincy bronze borings	8.00
Zincy bronze solids	8.00

OPA Group 3†

Fired rifle shells	8.25
Brass pipe	7.50
Old rolled brass	7.00
Admiralty condenser tubes	7.50
Muntz metal condenser tubes	7.00
Plated brass sheet, pipe reflectors	6.50
Manganese bronze solids	7.25[1]
Manganese bronze solids	6.25[2]
Manganese bronze borings	6.50[1]
Manganese bronze borings	5.50[2]

OPA Group 4†

Refinery brass	4.75*

*Price varies with analysis. [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Other Copper Alloys†

Briquetted Cartridge Brass Turnings	8.625
Cartridge Brass Turnings, Loose	7.875
Loose Yellow Brass Trimmings	7.875

Aluminum

Plant scrap, segregated

2s solids	7.50
Dural alloys, solids 14, 17, 18, 24S	2.50
25S	3.00
turnings, dry basis	3.00
Low copper alloys 51, 52, 61, 63S solids	5.00
turnings, dry basis	3.00

Plant scrap, mixed

Solids	2.00
Turnings, dry basis	1.50

Obsolete scrap

Pure cable	7.50
Old sheet and utensils	4.00
Old castings and forgings	3.25
Pistons, free of struts	3.00
Pistons, with struts	1.50
Old alloy sheet	3.00

Magnesium

Segregated plant scrap

Pure solids and all other solids, exempt	
Borings and turnings	1.50

Mixed, contaminated plant scrap

Grade 1 solids	3.00
Grade 1 borings and turnings	2.00
Grade 2 solids	2.00
Grade 2 borings and turnings	1.00

Zinc

New zinc clippings, trimmings	6.00
Engravers, lithographers plates	6.00
Old zinc scrap	4.75
Unsweated zinc dross	5.00
Die cast slab	4.50
New die cast scrap	4.45
Radiator grilles, old and new	3.50
Old die cast scrap	3.00

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead inc. cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ½%, 26c. per lb.; 90 to 98% Ni, 26c. per lb. contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point)

Copper: Cast, elliptical, 15 in. and longer	25⅛
Electrolytic, full size	22⅞
cut to size	30⅛
Rolled, oval, straight, 15 in. and longer	23¼
Curved	24¼
Brass Cast, 82-20, elliptical, 15 in. and longer	23⅜
Zinc: Cast, 99.99, 16 in. and over	16¼
Nickel: 99% plus, cast	47
Rolled, depolarized	48
Silver: Rolled, 999 fine per Troy (1-9) oz., per oz.	58

Chemicals

(Cents per lb., delivery from New York)

Copper cyanide, tech., 100-lb. bbls. 1-5	5.65
Copper sulphate, 99.5 crystals, bbls.	13.00-13.50
Nickel salts, single, 425-lb. bbls.	34.00
Silver cyanide, 100 oz., lots	40.82-41.13
Sodium cyanide, 96% dom., 100-lb. dms.	0.15
Zinc cyanide, 100-lb. dms.	33.00
Zinc, sulphate, 89% crystals, bbls.	6.80

SCRAP

Scrap Market Trends Unchanged

• • • Prices this week show very little change except in Detroit where there have been increases and, except for readjustments of prices within a schedule, are basically the same as last week. While there does not appear from any district report to be transactions of a large scale nature, the market in general seems to be holding its own. Cast prices remain at ceilings.

However, in Pittsburgh there were large purchases of heavy melting stock coming from eastern railroads and shipyards. While this hasn't affected the Pittsburgh market it is likely to exert an effect next week on the Philadelphia, Boston and New York markets.

The outlook for scrap in New England this winter is discouraging. It is probable that yard shipments to consuming points will establish a new low record for that period. Almost without exception yards have fewer on their payrolls than ever before. Some do not have enough labor to run their trucks; none have enough to prepare anything like a normal supply of material. Moreover, the chances are against an increase of the labor supply unless there is an abrupt ending of the European and Japanese wars accompanied by a depression that would throw a great many out of work. The time of year is coming when outdoor work is unattractive and men want to get under cover for the winter. In some instances yards are seriously considering closing because of a lack of help.

•

PITTSBURGH—The entry of one large consumer this week into the market for 25,000 tons of railroad heavy melting and industrial No. 1 heavy melting at $17.75 marked the first large transaction in many months. However, all of this scrap was bought outside the district, coming almost entirely from eastern railroads and eastern shipyards. The result of this was not, therefore, reflected in the Pittsburgh district prices. The industrial scrap purchased was practically all shipplate and, while such plate is available in some quantity from Pittsburgh shipbuilders, none of the local material went into the order.

•

CHICAGO—Scrap prices now appear to have reached a more stable level than at any time in the past two months although some adjustments between individual items must be expected. No. 1 RR heavy melting appears especially vulnerable although railroads are strongly resisting attempts to lower the price of this grade. Indications of strength in the better open hearth grades at the dealer level have not been reflected in higher mill buying prices. Cast scrap prices continue to be quoted on a shipping point basis, but there is definite evidence that less freight is acceptable to most foundry buyers. A maximum of $2 a ton freight on the better cast grades appears to be the highest obtainable.

•

DETROIT—Scrap prices strengthened notably this week in the wake of amplified bidding on automotive lists. There are some indications that brokers and dealers are raising offers to cover short positions, particularly in blast furnace grades, inasmuch as there did not appear to be any firm commitments by mills at the end of the month which would back up the better bids for most items on the lists. The only grades which continued in poor demand on these bids were the alloys. On the other hand, some well prepared offerings of scrap, clean and thoroughly segregated, brought definitely more than the prices indicated on current quotations.

•

ST. LOUIS—Scrap iron is being offered freely in the St. Louis industrial district by industries and railroads. The market is being pretty well choked up as mills are buying nothing for the moment. New railroad lists include Missouri Pacific, 16 carloads; Missouri, Kansas, Texas, 8 carloads; Panama Canal Railway, 2000 tons.

•

BOSTON—Prices for No. 1 steel are a shade firmer, about 25c. a ton; but No. 2 is no higher. The better feeling in turnings noted a week ago has evaporated and the price range has backed down to $4 to $4.50 a ton for anything. Generally, yards are moving so little material that true values are difficult to establish. Foundry scrap is almost extinct.

•

NEW YORK—Prices are holding at the schedule established several weeks ago, although there is a lack of volume at these levels since producers and dealers do not care to sell. Several Eastern Pennsylvania mills are purchasing. Current prices do not permit compensation for bundling labor costs.

•

CINCINNATI—With one of the leading mills in the area out of the scrap market for several months, even greater quiet has descended on the market. Dealers indicate that virtually no buying is reported but, on the other hand, there is not much scrap coming out into the market at present prices so that the general price structure remains unchanged. Dealers continue to adopt a watchful waiting attitude but any tendency toward speculation is being held to a minimum.

PHILADELPHIA — Although demand for scrap in this district continues light with the three purchasers here taking only small quantities, scrap prices remain firm with only turnings showing a drop of 50c. to $1.00, to $9.50. Dealers are hoping for a price increase and are showing some reluctance to sell scrap at the current prices. Although dealers say that they are stockpiling the material rather than accept prevailing prices, scrap shipments are so light that there is little else they can do. Their particular peeve is the two dollar differential for No. 2 bundles which because of their light weight require so much additional handling.

•

BUFFALO — Widening of the spread between light and heavy furnace scrap highlighted another quiet week with the leading consumer still on the sidelines. While better grades were firm, machine shop turnings dropped 50c. a ton, and cast iron borings and mixed borings and turnings were off $1. No. 1 busheling, on the other hand, was 50c. higher. Republic Steel placed an embargo on scrap shipments to its strikebound Buffalo plant, but so far this development has had no effect on trade sentiment. Scattered buying tends to hold low phos items steady. Cast iron scrap continues scarce at ceiling prices.

•

BIRMINGHAM—Material continues to move at a very slow pace here and no indications of increased activity have appeared. A strike at the Gadsden plant of Republic Steel Corp., which closed down the 6 active open hearths there, has retarded purchases by that large consumer. Prices are unchanged.

•

CLEVELAND—With few changes in the market here a few spasmodic sales have kept the market from going down any further. There are no indications that the situation here will change in the next few weeks and an undercurrent, perhaps the feeling that the Germans will hang on through the winter, has kept the market steady.

DPC Listing Draws One More Criticism

Cleveland

• • • Posting of the DPC surplus property list, aimed at providing industry with advance information on the properties against the day when the government will no longer need them, drew a slap on the wrist from Undersecretary of War, Robert P. Patterson. In a telegram to Col. E. A. Lynn, Chief of Cleveland Ordnance District, the undersecretary stated that rumors that government-owned plants are soon to be sold and closed have had an adverse effect on essential war production.

[Going prices as obtained in the trade by IRON AGE editors, based on representative tonnages (for ceiling prices see O. P. A. schedule No. 4).]

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. melting	$15.50 to	$16.00
RR. hvy. melt	17.50 to	18.00
No. 2 hvy. melting	....	14.00
RR. scrap rails	....	21.50
Rails 3 ft. and under	....	23.50
No. 1 comp'd sheets	15.50 to	16.00
Hand bdld. new shts.	15.50 to	16.00
Hvy. axle turn.	15.50 to	16.00
Hvy. steel forge turn.	15.50 to	16.00
Mach. shop turn.	9.00 to	9.50
Short shov. turn.	12.00 to	12.50
Mixed bor. and turn.	9.50 to	10.00
Cast iron borings	10.50 to	11.00
Hvy. break. cast	16.50 plus frt.	
No. 1 cupola	20.00 plus frt.	
RR. knuck. and coup.	....	21.50
RR. coil springs	....	21.50
Rail leaf springs	....	21.50
Rolled steel wheels	....	21.50
Low phos. billet crops	23.50 to	24.00
Low phos.	18.50 to	19.50
RR malleable	22.00 plus frt.	

CHICAGO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$16.25 to	$16.75
No. 2 hvy. melting	15.25 to	15.75
No. 1 bundles	15.25 to	15.75
No. 2 dealers' bndls.	14.25 to	14.75
Galv. bundles (No.3)	12.25 to	12.75
Mach. shop turnings.	7.50 to	8.00
Short shoveling trngs.	8.00 to	8.50
Cast iron borings	8.00 to	8.50
Mix. bor. & short turn.	8.00 to	8.50
Low phos. hvy. forge	19.50 to	20.00
Low phos. plates	18.25 to	18.75
No. 1 RR hvy. mltng.	17.25 to	17.75
Reroll rails	....	22.25
Cut rails, 3 ft. and under	21.25 to	21.75
Locomotive tires, cut	18.75 to	19.25
Cut holsters & side frames	18.25 to	18.75
Angles & splice bars.	20.25 to	20.75
No. 3 steel wheels	18.25 to	18.75
Couplers & knuckles.	19.00 to	19.50
Miscellaneous rails	19.25 to	19.75
Agricul. malleable	20.00 to	20.50
RR. malleable	21.00 to	21.50
St'dard stl. car axles	23.00 to	23.50
FOB shipping point		
No. 1 mach. cast	....	20.00
No. 1 agricul. cast	....	20.00
Cast iron car wheels	....	20.00
Hvy. breakable cast.	....	16.50
RR grate bars	....	15.25
Brake shoes	....	15.25
Stove plate	....	19.00
Clean auto cast	....	20.00

CINCINNATI

Per gross ton delivered to consumer:

No. 1 hvy. melting	$15.00 to	$15.50
No. 2 hvy. melting	14.00 to	14.50
No. 1 bundles	15.00 to	15.50
No. 2 bundles	13.00 to	13.50
Mach. shop turnings.	5.50 to	6.00
Shoveling turnings	7.00 to	7.50
Cast iron borings	7.50 to	8.00
Mixed bor. & turns.	6.00 to	6.50
No. 1 cupola cast	....	21.00
Hvy. breakable cast.	....	16.50
Low phos. plate	20.00 to	21.00
Scrap rails	20.00 to	21.00
Stove plate	15.50 to	16.00

BOSTON

Dealers' buying prices per gross ton, f.o.b. cars

No. 1 hvy. melting	$11.00 to	$11.25
No. 2 hvy. melting	....	9.75
Bundled skeleton	....	9.75
Turnings, shovelings	4.00 to	4.50
Turnings, regular	4.00 to	4.50
Mixed bor. & turns.	4.00 to	4.50
Mixed alloy turnings	4.00 to	4.50
Clean cast chem. bor.	13.06 to	14.15
Delivered to fdry. per gr. ton		
Breakable cast	21.57 to	21.87
Stove plate	20.00 to	23.51
Machinery cast, truck	21.00 to	23.51

DETROIT

Per gross ton, brokers' buying prices:

No. 1 hvy. melting	$11.50 to	$12.00
No. 2 hvy. melting	11.50 to	12.00
No. 1 bundles	11.50 to	12.00
New busheling	11.50 to	12.00
Mach. shop turnings	5.75 to	6.25
Short shov. turnings	7.00 to	7.50
Cast iron borings	6.50 to	7.00
Mixed bor. & turns.	5.75 to	6.25
No. 1 cupola cast	19.00 to	20.00
Charging box cast	14.50 to	15.50
Hvy. breakable cast.	13.00 to	13.50
Stove plate	17.00 to	17.50
Flashings	11.50 to	12.00
Low phos. plate	14.00 to	15.00
Automotive cast	19.00 to	20.00

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. melting	$14.50 to	$15.50
No. 2 hvy. melting	13.50 to	14.50
No. 2 bundles	12.50 to	13.50
Mach. shop turnings	....	9.50
Shoveling turnings	11.00 to	12.00
Cast iron borings	10.50 to	11.00
Mixed bor. & turns.	....	9.50
No. 1 cupola cast	....	*20.00
Hvy. breakable cast.	....	*16.50
Cast, charging box	....	*19.00
Hvy. axle, forge turn.	16.00 to	16.25
Low phos. plate	18.25 to	18.75
Low phos. punchings	19.75 to	20.25
Billet crops	18.25 to	18.75
RR. steel wheels	19.00 to	19.50
RR. coil springs	19.00 to	19.50
RR. malleable	....	*22.00

*F.o.b. shipping point.

ST. LOUIS

Per gross ton delivered to consumer:

Hvy. melting		$16.00
No. 1 locomotive tires	$16.00 to	16.50
Misc. stand. sec. rails	17.00 to	17.50
Railroad springs	17.00 to	18.00
Bundled sheets	13.00 to	13.50
Heavy turnings	8.00 to	8.50
Rerolling rails	....	21.00
Steel car axles	....	23.50
Steel rails under 3 ft.	....	21.50
Steel angle bars	19.00 to	19.50
Cast iron car wheels	....	20.00
No. 1 machinery cast	....	20.00
Railroad malleable	20.00 to	20.50
Breakable cast	....	16.50
Stove plate	....	17.00
Grate bars	....	15.25
Brake shoes	....	15.25

Note: Cast grades f.o.b. Shipping Point.

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting	$14.50 to	$15.00
No. 2 hvy. melting	13.50 to	14.00
No. 2 bundles	12.50 to	13.00
No. 1 busheling	11.50 to	12.00
Scrap rails	14.00 to	14.50
Rails for rerolling	17.00 to	17.50
Rails 3 ft. & under	17.00 to	17.50
Angles & splice bars.	16.50 to	17.00
Long turnings	4.50 to	5.00
Cast iron borings	6.50 to	7.00
Steel axles	14.50 to	15.00
Stove plate	16.50 to	17.00
Bar crops and plate.	16.00 to	16.50
Structural and plate.	16.00 to	16.50
No. 1 cast	20.00 to	21.00
Cast iron carwheels	13.00 to	13.50

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. melting	$16.00 to	$16.50
No. 2 hvy. melting	16.00 to	16.50
Low phos. plate	17.50 to	18.00
No. 1 busheling	16.00 to	16.50
Hydraulic bundles	16.00 to	16.50
Mach. shop turnings	9.00 to	9.50
Short shovel. trngs.	11.00 to	11.50
Cast iron borings	10.00 to	10.50

NEW YORK

Dealers' buying prices, per gross ton, on cars:

No. 1 hvy. melting	$11.00 to	$11.50
No. 2 hvy. melting	10.00 to	10.50
Hyd. comp. black bundles	9.00 to	9.50
Hyd. comp. galv. bundles	7.00 to	7.50
Hvy. breakable cast.	....	16.50
Charging box cast	....	19.00
No. 1 cupola cast	....	20.00
Clean auto cast	....	20.00
Unstrip. motor blks.	....	17.50
Stove plate	....	19.00
Clean chem. cast bor.	....	14.32
Mach. shop turnings.	5.00 to	5.50
Mixed bor. & turns.	5.00 to	5.50

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$16.50 to	$17.00
No. 1 bundles	15.00 to	15.50
No. 2 bundles	14.00 to	14.50
No. 2 hvy. melting	15.00 to	15.50
Mach. shop turnings	8.50 to	9.00
Shoveling turnings	11.00 to	11.50
Cast iron borings	10.00 to	10.50
Mixed bor. & turns.	10.00 to	10.50
No. 1 cupola cast	20.50 to	22.50
Stove plate	19.50 to	21.50
Low phos. plate	....	21.75
Scrap rails	19.00 to	19.25
Rails 3 ft. & under.	....	22.75
RR steel wheels	....	23.75
Cast iron car wheels	....	20.00
RR coil & leaf sprgs.	....	23.75
RR knuckles & coup.	....	23.75
RR malleable	....	22.00
No. 1 busheling	15.50 to	16.00

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. melting	$15.00 to	$15.50
No. 2 hvy. melting	15.00 to	15.50
Compressed sheet stl.	15.00 to	15.50
Drop forge flashings	15.00 to	15.50
No. 2 bundles	14.50 to	15.00
Mach. shop turnings.	6.00 to	6.50
Short shovel. trngs.	10.00 to	11.00
No. 1 busheling	14.50 to	15.00
Steel axle turnings	14.50 to	15.00
Low phos. billet and bloom crops	20.00 to	21.00
Cast iron borings	10.00 to	11.00
Mixed bor. & turns.	9.50 to	10.50
No. 2 busheling	13.00 to	13.50
No. 1 machine cast.	20.00 plus frt.	
Railroad cast	20.00 plus frt.	
Railroad grate bars	....	15.25
Stove plate	19.00 plus frt.	
RR. hvy. melting	17.00 to	17.50
Rails 3 ft. & under	23.00 to	23.50
Rails 18 in. & under	24.25 to	24.75
Rails for rerolling	23.00 to	23.50
Railroad malleable	22.00 plus frt	
Elec. furnace punch.	18.00 to	19.00

SAN FRANCISCO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$16.00 to	$16.75
RR hvy. melting	16.00 to	16.75
No. 2 hvy. melting	15.00 to	15.75
No. 2 bales	14.00 to	14.75
No. 3 bales	10.00 to	10.75
Mach. shop turnings.	....	7.00
Elec. furn. 1 ft., under	16.00 to	17.50
No. 1 cupola cast	20.00 to	22.00

LOS ANGELES

Per gross ton delivered to consumer:

No. 1 hvy. melting	$15.00 to	$16.00
No. 2 hvy. melting	14.00 to	15.00
No. 2 bales	13.00 to	14.00
No. 3 bales	10.00 to	10.50
Mach. shop turnings.	....	5.00
No. 1 cupola cast	20.00 plus frt.	

SEATTLE

Per gross ton delivered to consumer:

No. 1 hvy. melting	....	$13.50
RR hvy. melting	....	13.50
No. 3 bundles	....	11.50
Elec. furn. 1 ft., und.	$16.00 to	17.00
No. 1 cupola cast	20.00 plus frt.	

Comparison of Prices . . .

Advances Over Past Week in **Heavy Type**; Declines in *Italics*. (Prices Are F.O.B. Major Basing Points)

Flat Rolled Steel: (Cents Per Lb.)	Oct. 31, 1944	Oct. 24, 1944	Sept. 26, 1944	Nov. 2, 1943
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate: (Dollars Per Base Box)				
Tin plate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tin plate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails: (Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel: (Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs, rerolling	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp	1.90	1.90	1.90	1.90

Pig Iron: (Per Gross Ton)	Oct. 31, 1944	Oct. 24, 1944	Sept. 26, 1944	Nov. 2, 1943
No. 2 fdy., Philadelphia	$25.84	$25.84	$25.84	$25.84
No. 2, Valley furnace	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti	25.11	25.11	25.11	24.68
No. 2, Birmingham	20.38	20.38	20.38	20.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa.	25.34	25.34	25.34	25.39
Basic, Valley furnace	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago	37.34	37.34	37.34	31.34
Ferromanganese‡	135.00	135.00	135.00	135.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡For carlots at seaboard.

Scrap: (Per Gross Ton)				
Heavy melt'g steel, P'gh	*$15.75*	$16.00	$17.25	$20.00
Heavy melt'g steel, Phila.	15.00	14.50	15.25	18.75
Heavy melt'g steel, Ch'go	16.50	16.50	18.50	18.75
No. 1 hy. comp. sheet, Det.	11.75	11.25	11.75	17.85
Low phos. plate, Youngs'n	17.75	17.50	19.50	22.50
No. 1 cast(Pittsburgh	20.00*	20.00*	20.00	20.00
No. 1 cast, Philadelphia	20.00*	20.00*	20.00	20.00
No. 1 cast, Chicago	20.00*	20.00*	22.17	20.00

*F.o.b. shipping point.

Coke, Connellsville: (Per Net Ton at Oven)				
Furnace coke, prompt	$7.00	$7.00	$7.00	$6.50
Foundry coke, prompt	8.25	8.25	8.25	7.50
Non-Ferrous Metals: (Cents per Lb. to Large Buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, Virgin, del'd.	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony, Laredo, Tex.	14.50	14.50	14.50	14.50

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 152-159D.

Composite Prices . . .

Starting with the issue of April 22, 1943, the weighted finished steel price index was revised for the years 1941, 1942 and 1943. See explanation of the change on page 90 of the April 22, 1943, issue.

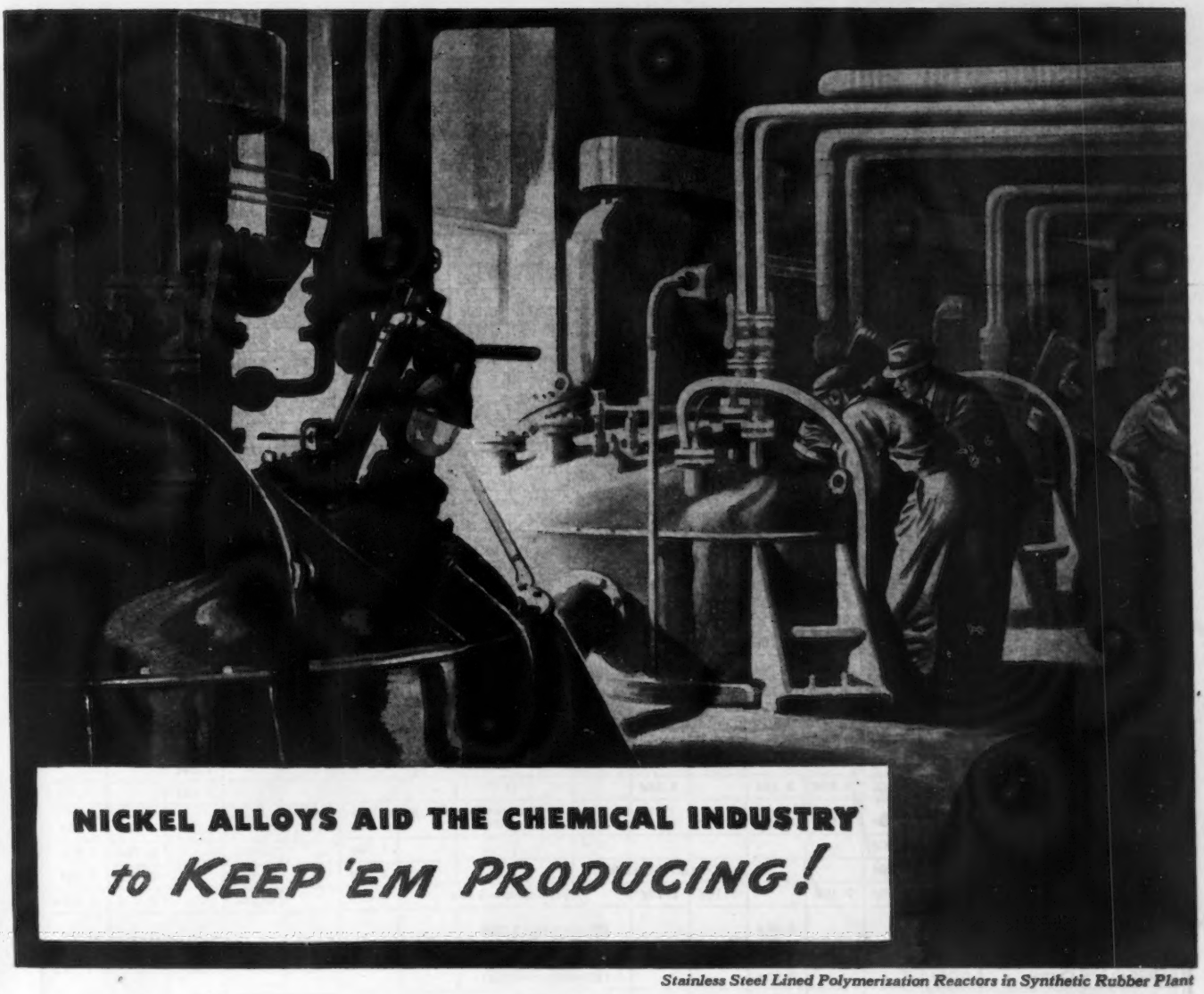
	FINISHED STEEL	PIG IRON	SCRAP STEEL
October 31, 1944	2.25513c. a Lb.	$23.61 a Gross Ton	$15.75 a Gross Ton
One week ago	2.25513c. a Lb.	$23.61 a Gross Ton	$15.67 a Gross Ton
One month ago	2.25513c. a Lb.	$23.61 a Gross Ton	$17.00 a Gross Ton
One year ago	2.26190c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton

	FINISHED STEEL HIGH	FINISHED STEEL LOW	PIG IRON HIGH	PIG IRON LOW	SCRAP STEEL LOW	SCRAP STEEL HIGH
1943	2.25513c.,	2.25513c.,	$23.61	$23.61	$19.17	$19.17
1942	2.26190c.,	2.26190c.,	23.61	23.61	19.17	19.17
1941	2.43078c.,	2.43078c.,	$23.61, Mar. 20	$23.45, Jan. 2	$19.17, Apr. 10	$22.00, Jan. 7
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	16.04, Apr. 9	21.83, Dec. 30
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12	14.08, May 16	22.50, Oct. 3
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6	11.00, June 7	15.00, Nov. 22
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	12.67, June 8	21.92, Mar. 30
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	12.67, June 9	17.75, Dec. 21
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14	10.33, Apr. 29	13.42, Dec. 10
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27	9.50, Sept. 25	13.00, Mar. 13
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3	6.75, Jan. 3	12.25, Aug. 8
1932	1.89196c., July 5	1.83901c., Mar. 1	14.81, Jan. 5	13.56, Dec. 6	6.43, July 5	8.50, Jan. 12
1931	1.99626c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	8.50, Dec. 29	11.33, Jan. 6
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	11.25, Dec. 9	15.00, Feb. 18
1929	2.31773c., May 28	2.26498c., Oct. 29	18.71, May 14	18.21, Dec. 17	14.08, Dec. 3	17.58, Jan. 29

Weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.



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Finished Iron and Steel Prices . . .

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. Extras apply. Delivered prices do not reflect 3% tax on freight. (1) Mill run sheet, 10c. per lb. under base; primes 25c. above base. (2) Unassorted 8-lb. coating. (3) Widths up to 12-in. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25c. per 100 lb. to fabricators. (8) Also shafting. For quantities of 20,000 to 29,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (12) Boxed. (13) Portland and Seattle price, San Francisco 2.50c. (14) This base price for annealed, bright finish wires, commercial spring wire.

Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Provo, Utah	Pacific Ports, Cars[10]	DELIVERED TO Detroit	New York	Philadelphia
Hot Rolled Sheets	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢			2.65¢	2.20¢	2.34¢	2.27¢
Cold Rolled Sheets[1]	3.05¢	3.05¢	3.05¢	3 05¢		3.05¢	3.05¢		3.15¢	3.05¢			3.70¢	3.15¢	3.39¢	3.37¢
Galv. Sheets (24 gage)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢			4.05¢		3.74¢	3.67¢
Enameling Sheets (20 gage)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢			4.00¢	3.45¢	3.71¢	3.67¢
Long Ternes[2]	3.80¢	3.80¢	3.80¢										4.55¢		4.16¢	4.12¢
Hot Rolled Strip[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢			2.75¢	2.20¢	2.46¢	
Cold Rolled Strip[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)						2.90¢	3.16¢	
Cooperage Stock Strip	2.20¢	2.20¢			2.20¢		2.20¢								2.56¢	
Commodity C-R Strip	2.95¢	3.05¢		2.95¢			2.95¢	(Worcester = 3.35¢)						3.05¢	3.31¢	
Coke Tin Plate, Base Box	$5.00	$5.00	$5.00						$5.10						5.36¢	5.32¢
.50 Electro Tin Plate, Box	$4.50	$4.50	$4.50						$4.60							
.75 Electro Tin Plate, Box	$4.65		$4.65						$4.75							
Black Plate (29 gage)[5]	3.05¢	3.05¢	3.05¢						3.15¢				4.05¢[12]			3.37¢
Mfg. Ternes, Special Box	$4.30	$4.30	$4.30						$4.40							
Carbon Steel Bars	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.50¢		2.80¢	2.25¢	2.49¢	2.47¢
Rail Steel Bars[6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢		2.80¢			
Reinforcing (Billet) Bars[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢		2.55¢[12]	2.25¢	2.39¢	
Reinforcing (Rail) Bars[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢		c2.55¢[12]	2.25¢		2.47¢
Cold Finished Bars[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢		(Detroit = 2.70¢)				(Toledo = 2.80¢)			2.99¢	2.97¢
Alloy Bars, Hot Rolled	2.70¢	2.70¢				2.70¢		(Bethlehem, Massilon, Canton = 2.70¢)						2.80¢		
Alloy Bars, Cold Drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢								3.45¢		
Carbon Steel Plates	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	(Coatesville and Claymont = 2.10¢) 2.10¢	2.35¢		2.45¢	2.60¢	2.65¢	2.32¢	2.29¢	2.15¢
Floor Plates	3.35¢	3.35¢									3.70¢		4.00¢		3.71¢	3.67¢
Alloy Plates	3.50¢	3.50¢			(Coatesville = 3.50¢)						3.95¢		4.15¢		3.70¢	3.59¢
Structural Shapes	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem = 2.10¢			2.45¢		2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R 0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)									
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)									
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)									
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)									
Bright Wire[14]	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)		(Duluth = 2.65¢)				3.10¢			2.92¢
Galvanized Wire	Add proper size extra and galvanizing extra to Bright Wire base															
Spring (High Carbon)	3.20¢	3.20¢		3.20¢			(Worcester = 3.30¢)						3.70¢			3.52¢
Steel Sheet Piling	2.40¢	2.40¢				2.40¢							2.95¢			2.72¢

EXCEPTIONS TO PRICE SCHED. NO. 6

Slabs—Andrews Steel Co. $41 basing pts.; Wheeling Steel Corp. (rerolling) 4 in. sq. or larger $37.75 f.o.b. Portsmouth, Ohio; Empire Sheet & Tin Plate Corp. $41; Phoenix Iron Co. (rerolling) $41, (forging) $47; Granite City Steel $47.50.

Blooms—Phoenix Iron Co. (rerolling) $41, (forging) $47; Pgh. Steel Co. (reroll) $38.25, (forging) $44.25. Wheeling Steel Corp. (rerolling) 4 in. sq. or larger $37.75 f.o.b. Portsmouth.

Sheet bar—Empire Sheet & Tin Plate Co. $39 mill; Wheeling Steel Corp. $38 Portsmouth, Ohio.

Billets, Forging—Andrews Steel Co. $50 basing pts.; Follansbee Steel Corp. $49.50 Toronto; Phoenix Iron Co. $47.00 mill. Geneva Steel Co. $64.64 f.o.b. Pacific Coast; Pittsburgh Steel Co. $49.50.

Billets, Rerolling—Continental Steel Corp. may charge Acme Steel in Chicago switching area $34 plus freight from Kokomo, Ind.; Northwestern Steel & Wire Co. (Lend-Lease) $41 mill; Wheeling Steel Corp. 4 in. sq. or larger $37.75, smaller $39.50 f.o.b. Portsmouth, Ohio; Stanley Works may sell Washburn Wire Co. under allocation at $39 Bridgeport, Conn.; Keystone Steel & Wire Co. may sell Acme Steel Co. at Chicago base, f.o.b. Peoria; Phoenix Iron Co. $41 mill; Continental Steel Corp. (1¾ x 1¾) $39.50, (2 x 2 $40.60 Kokomo, Ind. (these prices include $1 size extra); Keystone Steel & Wire Co. $36.40 Peoria; Connors Steel Co. $50.69 Birmingham; Ford Motor Co. $34 Dearborn, Mich. Geneva Steel Co. $58.64 f.o.b. Pac. C. Pgh. Steel Co. $43.50.

Structural Shapes—Phoenix Iron Co. $2.35 basing pts. (export) $2.50 Phoenixville; Knoxville Iron Co. $2.30 basing points.

Rails—Sweet Steel Co. (rail steel) $50 mill; West Virginia Rail Co. (lightweight) on allocation based Huntington, W. Va.; Colorado Fuel & Iron Corp., $45 Pueblo.

Hot Rolled Plate—Granite City Steel Co. $2.65 mill; Knoxville Iron Co. $2.25 basing pts.; Kaiser Co. and Geneva Steel Co. $3.20 Pacific Ports; Central Iron and Steel Co. $2.50 basing points; Granite City Steel Co. $2.35 Granite City.

Merchant Bars—W. Ames Co., 10 tons and over, $2.85 mill; Eckels-Nye Steel Corp., $2.50 basing pts. (rail steel) $2.40; Phoenix Iron Co. $2.40 basing pts.; Sweet Steel Co. (rail steel) $2.35 mill; Joslyn Mfg. & Supply Co., $2.35 Chicago; Calumet Steel Div., Borg Warner Corp. (8 in. mill bar) $2.35 Chicago; Knoxville Iron Co. $2.30 basing pts. Laclede Steel Co., sales to LaSalle Steel granted Chicago base, f.o.b. Madison, Ill. Milton Mfg. Co. $2.75 f.o.b. Milton, Pa.

Pipe Skelp—Wheeling Steel Corp., Benwood, $2.05 per cwt.

Reinforcing Bars—W. Ames & Co., 10 tons and over, $2.85 mill; Sweet Steel Co. (rail steel) $2.35 mill; Columbia Steel Co. $2.50 Pacific Ports.

Cold Finished Bars—Keystone Drawn Steel Co. on allocation, Pittsburgh c.f. base plus c/l freight on hot rolled bars Pittsburgh to Spring City, Pa.; New England Drawn Steel Co. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to Mansfield, Mass., f.o.b. Mansfield; Empire Finished Steel Corp. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to plants f.o.b. plant; Compressed Steel Shafting Co. on allocation outside New England, Buffalo base plus c/l freight Buffalo to Readville, Mass. f.o.b. Readville; Medart Co. in certain areas, Chicago c.f. base plus c/l freight Chicago to St. Louis, f.o.b. St. Louis.

Alloy Bars—Texas Steel Co. for delivery except Texas and Okla. Chicago, base, f.o.b. Fort Worth, Tex.; Connors Steel Co. shipped outside Ala., Mississippi, Louisiana, Georgia, Florida, Tenn., Pittsburgh base, f.o.b. Birmingham.

Hot Rolled Strip—Joslyn Mfg. & Supply Co. $2.30 Chicago; Knoxville Iron Co. $2.25 basing pts.

Hot Rolled Sheets—Andrews Steel Co., Middletown base on shipments to Detroit or area; Parkersburg Iron & Steel Co., $2.25 Parkersburg.

Galvanized Sheets—Andrews Steel Co., $3.75 basing pts.; Parkersburg Iron & Steel Co. $3.85 Parkersburg; Apollo Steel Co. $3.75 basing pts.; Continental Steel Co., Middletown base on Kokomo, Ind., product; Superior Sheet Steel Co., Pittsburgh base except for Lend-Lease.

Pipe and Tubing—South Chester Tube Co. when priced at Pittsburgh, freight to Gulf Coast and Pacific Ports may be charged from Chester, Pa., also to points lying west of Harrisburg, Pa.

Black Sheets—Empire Sheet and Tinplate Co., maximum base price mill is $2.45 per 100 lb., with differentials, transportation charges, etc., provided in RPS. No. 6.

SHAPED WIRE FOR MANY NEEDS

FROM COTTER PINS TO---

★ Wire drawn to special shapes has an important place in modern production. It adds to the utility and appearance of many products, cuts manufacturing costs, and frequently saves valuable production time.

Continental offers a special service in shaped wire. Continental wire, to fit particular needs, can be supplied to manufacturer's specifications in a wide variety of shapes, sizes, and tempers (no cross-sectional dimension to be greater than ½ inch). Many different finishes and coatings also available.

If you have use for shaped wire, you are invited to take advantage of Continental's experience in developing manufacturers' wire for special jobs. Write or wire today.

CONTINENTAL STEEL CORPORATION, KOKOMO, INDIANA

(The Superior Sheet Steel Co., Canton, Ohio—A subsidiary)

CONTINENTAL
STEEL CORPORATION

PRODUCERS OF— SHEETS: Black, Galvanized, Copperior, Hot and Cold Rolled, Special Coated, Long Terne, etc.
WIRE: Bright Basic, Annealed, KONIK, Coppered, Tinned, Special Manufacturer's, etc.
Nails, Staples, All styles of fence, Gates, Steel Roofing, other steel products.

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendment to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 8617-20	Hot Rolled NE 9442-45 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-48 Ann.
**Philadelphia	3.518	4.872[6]	5.018[a]	3.922	4.772	3.605	3.866	3.822	4.072	5.966	7.066	7.272	8.322
New York	3.590	4.613[3]	5.010	3.974[6]	4.772	3.768	3.758	3.853	4.103	6.008	7.108	7.303	8.353
Boston	3.744	4.744[9]	5.224[9]	4.106	4.715	3.912	3.912	4.044	4.144	6.162	7.262	7.344	8.394
Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.759	3.802	4.052	....	....	....	....
Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.165	....	....	....	....
Chicago	3.25	4.20	5.231	3.60	4.65[17]	3.55	3.55	3.50	3 75	5 75	6.85	6.85	7.90
Milwaukee	3.387	4.337[3]	5.272[4]	3.737	4.787[17]	3.687	3.687	3.637	3 887	5 987	7.087	7.087	8.137
Cleveland	3.35	4.40	4.877[4]	3.60	4.45	3.40	3.588	3 35	3.75	5 956	7.056	6.85	7.90
Buffalo	3.35	4.40	4.75[4]	3.819	4.669	3.63	3.40	3.35	3.75	5.75	6.85	6.85	7.90
Detroit	3.45	4.50	5.00[4]	3.70	4.65[17]	3.609	3.661	3.45	3.80	6.08	7.18	7.159	8.209
Cincinnati	3.425	4.475[3]	4.825[5]	3.675	4.711	3.611	3.691	3.611	4.011	....	....	....	....
St. Louis	3.397	4.347[3]	5.172[4]	3.747	4.931[17]	3.697	3.697	3.647	4.031	6.131	7.231	7.231	8.281
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3 75	5.75	6.85	6.85	7.90
St. Paul	3.51	4.48	5.257[4]	3.86	4.35[17]	3.813[3]	3.813[3]	3.763[3]	4.361	6.09	7.19	7.561	8.711
Omaha	3.865	5.443	5.608[4]	4.215	....	4.165	4.165	4.115	4.43	....	....	....	....
Indianapolis	3.58	3.58	4.568	4.918	3.768	4.78	3.63	3.58	3.98	8.08	7.18	7.18	8.23
Birmingham	3.45		4.75	3.70	....	3.55	3.55	3.50	4.43	....	....	....	....
Memphis	3.965[7]	4.66	3.265	4.215	....	4.065	4.065	4.015	4.33	....	....	....	....
New Orleans	4.068*	4.95	5.358	4.308	....	4.158	4.158*	4.108*	4.629	....	....	....	....
Houston	3.763	5.573	6.313[1]	4.313	....	4.25	4.25	3.75	6.373[3]	7.223	8.323	8.323	9.373
Los Angeles	5.00	7.20[3]	6.10[4]	4.95	5.813[15]	4.95	4.65	4.40	5.583	8.304	9.404	9.404	10.454
San Francisco	4.55[14]	7.30[4]	6.35[4]	4.50[14]	7.333[17]	4.65[14]	4.35[14]	4.15[14]	5.333	8.304	9.404	9.404	10.454
Seattle	4.65[12]	7.05[4]	5.95[4]	4.25[12]	....	4.75[12]	4.45[12]	4.35[12]	5.783	....	9.404	....	....
Portland	4.65[11]	6.60[4]	5.75[4]	4.75[11]	....	4.75[11]	4.45[11]	4.45[11]	5.533	8.304	9.404	8.304	9.404
Salt Lake City	4.53[17]	....	6.17[18]	5.53[17]	....	4.98[17]	4.98[17]	4.88[17]	5.90	....	....	....	....

MILL EXTRAS FOR NATIONAL EMERGENCY STEELS

Designation	Basic Open-Hearth		Electric Furnace		Designation	Basic Open-Hearth		Electric Furnace	
	Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs		Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs
NE 1330	0.10¢	$2.00	....	.....	NE 9415	0.75¢	$15.00	$1.25	$25.00
NE 1335	0.10	2.00	....	.....	NE 9417	0.75	15.00	1.25	25.00
NE 1340	0.10	2.00	....	.....	NE 9420	0.75	15.00	1.25	25.00
NE 1345	0.10	2.00	....	.....	NE 9422	0.75	15.00	1.25	25.00
NE 1350	0.10	2.00	....	.....	NE 9425	0.75	15.00	1.25	25.00
					NE 9427	0.75	15.00	1.25	25.00
NE 8612	0.65¢	$13.00	$1.15	$23.00	NE 9430	0.75	15.00	1.25	25.00
NE 8615	0.65	13.00	1.15	23.00	NE 9432	0.75	15.00	1.25	25.00
NE 8617	0.65	13.00	1.15	23.00	NE 9435	0.75	15.00	1.25	25.00
NE 8620	0.65	13.00	1.15	23.00	NE 9437	0.75	15.00	1.25	25.00
NE 8622	0.65	13.00	1.15	23.00	NE 9440	0.75	15.00	1.25	25.00
NE 8625	0.65	13.00	1.15	23.00	NE 9442	0.80	16.00	1.30	26.00
NE 8627	0.65	13.00	1.15	23.00	NE 9445	0.80	16.00	1.30	26.00
NE 8630	0.65	13.00	1.15	23.00	NE 9447	0.80	16.00	1.30	26.00
NE 8632	0.65	13.00	1.15	23.00	NE 9450	0.80	16.00	1.30	26.00
NE 8635	0.65	13.00	1.15	23.00					
NE 8637	0.65	13.00	1.15	23.00	NE 9722	0.65¢	$13.00	$1.15	$23.00
NE 8640	0.65	13.00	1.15	23.00	NE 9727	0.65	13.00	1.15	23.00
NE 8642	0.65	13.00	1.15	23.00	NE 9732	0.65	13.00	1.15	23.00
NE 8645	0.65	13.00	1.15	23.00	NE 9737	0.65	13.00	1.15	23.00
NE 8647	0.65	13.00	1.15	23.00	NE 9742	0.65	13.00	1.15	23.00
NE 8650	0.65	13.00	1.15	23.00	NE 9745	0.65	13.00	1.15	23.00
					NE 9747	0.65	13.00	1.15	23.00
NE 8712	0.70¢	$14.00	$1.20	$24.00	NE 9750	0.65	13.00	1.15	23.00
NE 8715	0.70	14.00	1.20	24.00	NE 9763	0.65	13.00	1.15	23.00
NE 8717	0.70	14.00	1.20	24.00	NE 9768	0.65	13.00	1.15	23.00
NE 8720	0.70	14.00	1.20	24.00					
NE 8722	0.70	14.00	1.20	24.00	NE 9830	$1.30	$26.00	$1.80	$36.00
NE 8725	0.70	14.00	1.20	24.00	NE 9832	1.30	26.00	1.80	36.00
NE 8727	0.70	14.00	1.20	24.00	NE 9935	1.30	26.00	1.80	36.00
NE 8730	0.70	14.00	1.20	24.00	NE 9837	1.30	26.00	1.80	36.00
NE 8732	0.70	14.00	1.20	24.00	NE 9840	1.30	26.00	1.80	36.00
NE 8735	0.70	14.00	1.20	24.00	NE 9842	1.30	26.00	1.80	36.00
NE 8737	0.70	14.00	1.20	24.00	NE 9845	1.30	26.00	1.80	36.00
NE 8740	0.70	14.00	1.20	24.00	NE 9847	1.30	26.00	1.80	36.00
NE 8742	0.70	14.00	1.20	24.00	NE 9850	1.30	26.00	1.80	36.00
NE 8745	0.70	14.00	1.20	24.00					
NE 8747	0.70	14.00	1.20	24.00	NE 9912	$1.20	$24.00	$1.55	$31.00
NE 8750	0.70	14.00	1.20	24.00	NE 9915	1.20	24.00	1.55	31.00
					NE 9917	1.20	24.00	1.55	31.00
NE 9255	0.40¢	$8.00	....	.....	NE 9920	1.20	24.00	1.55	31.00
NE 9260	0.40	8.00	....	.....	NE 9922	1.20	24.00	1.55	31.00
NE 9261	0.65	13.00	....	.....	NE 9925	1.20	24.00	1.55	31.00
NE 9262	0.65	13.00	....	.....					
					NE 52100A	....	.....	$2.60	$52.00
					NE 52100B	....	.....	2.60	52.00
					NE 52100C	....	.....	2.60	52.00

Note 1: The ranges shown are restricted to sizes 100 sq. in. or less or equivalent cross-sectional area 18 in. wide or under, with a maximum individual piece weight of 7000 lb. irrespective of size. **Note 2:** For steels ordered to such ranges, below the size and weight restriction, the average of all the chemical checks must be within the limits specified subject to check analysis variations given in Table 4, Section 10, A.I.S.I. Steel Products Manual. **Note 3:** When acid open-hearth is specified and acceptable, add to basic open-hearth alloy differential 0.25c. per lb. for bars and bar strip and $5 per gross ton for billets, blooms and slabs. **Note 4:** The extras shown are in addition to the base price of $2.70 for 100 lb. on finished products and $54 per gross ton on semi-finished steel, major basing points, and are in cents per pound when applicable to bars and bar-strip, and in dollars per gross ton when applicable to billets, blooms and slabs. The full extra applicable over the base price is the total of all extras indicated by the specific requirements of the order. The higher extra shall be charged for any size falling between two published extras.

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1499 lb.; strip, extras on all quantities; bars, 1500 lb. base; NE alloy bars, 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 1999 lb. (7) 400 to 1999 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb. and over. (15) 1000 lb. and over. (16) 1500 lb. and over. (17) 2000 lb. and over. (18) 3500 lb. and over.

(a) Philadelphia: Galvanized sheet, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

*Add 0.271c. for sizes not rolled in Birmingham.

**City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

LAKE SUPERIOR ORES

(51.50% *Fe, Natural Content, Delivered Lower Lake Ports**)

	Per Gross Ton
Old range, bessemer, 51.50	$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorus, 51.50	4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

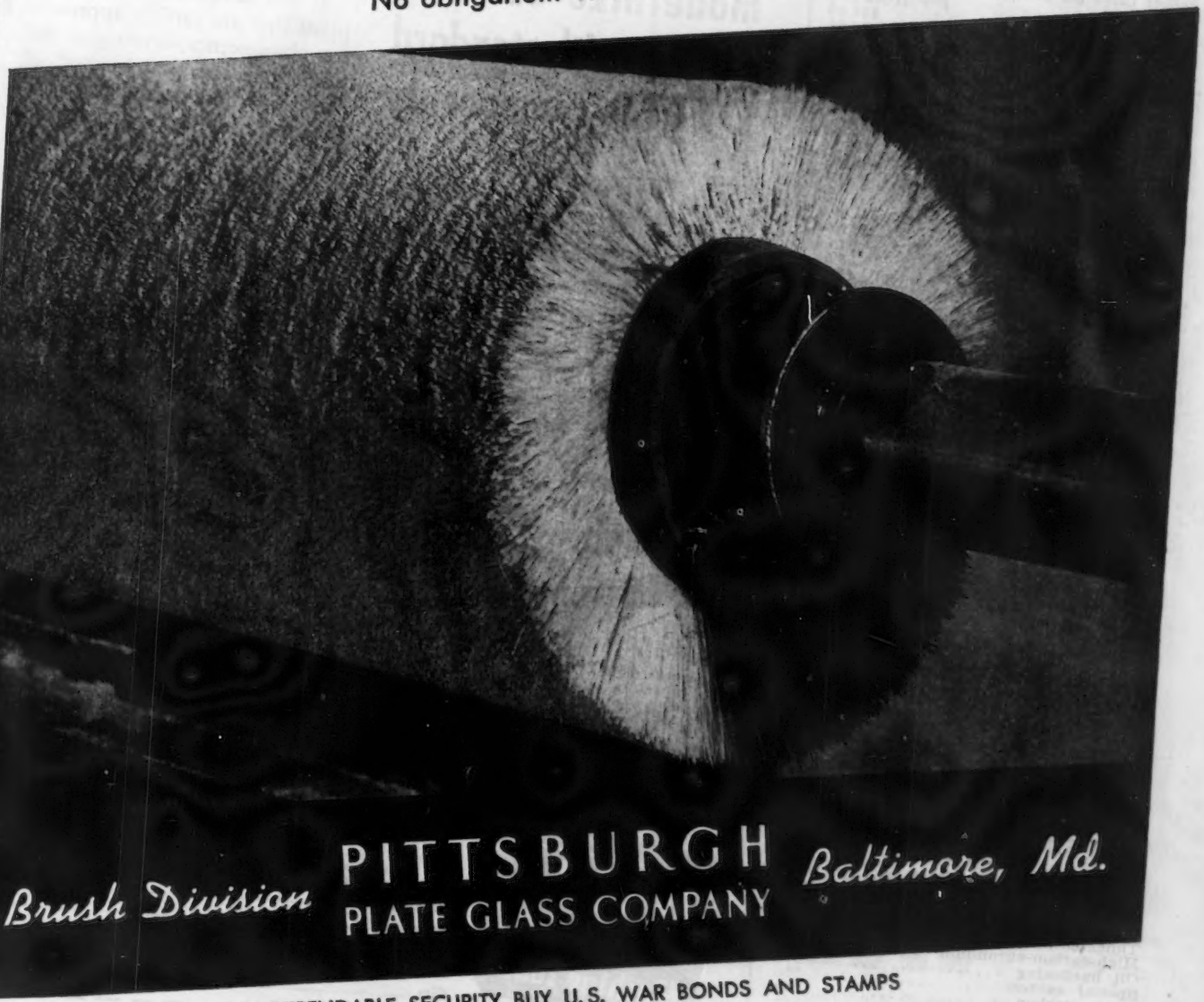
Effective CaF_2 Content:	*Base price per short ton*
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

FOR DEPENDABLE PRODUCTION
Turn To "EVEN TRIM"
Spiral Wound Brushes

Gain the benefits in uniform finish and uninterrupted production which these engineered-to-the-job brushes offer. There's a type for every finish desired, and for economy, they are refillable.

Let one of our engineering representatives work out the spiral wound brushes for your specific needs.

No obligation. Write or telephone today.



Brush Division PITTSBURGH PLATE GLASS COMPANY *Baltimore, Md.*

FOR DEPENDABLE SECURITY BUY U.S. WAR BONDS AND STAMPS

PRICES

SEMI-FINISHED STEEL

Ingots, Carbon, Rerolling

Base per gross ton, f.o.b. mill.... $31.00
Exceptions: Phoenix Iron Co. may charge $33.75; Kaiser Co., $43.00 f.o.b. Pacific Coast ports; Empire Sheet & Tinplate Co., $34.25; Pgh. Steel Co., $33.10.

Ingots, Carbon, Forging

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown $36.00
Exceptions: Phoenix Iron Co. may charge $13.00; Empire Sheet & Tinplate Co., $39.25, f.o.b. Mansfield, Ohio; West Coast producers, $48.00, f.o.b. Pacific Coast Ports; Pgh. Steel Co., $38.10.

Ingots, Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Coatesville, Chicago, Massillon, Pittsburgh $45.00
Exceptions: C/L delivered Detroit add $2.00; delivered East Michigan add $3.00. Connors Steel Co. may charge $45.00 f.o.b. Birmingham.

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.00 higher; delivered E. Michigan, $3 higher; f.o.b. Duluth, billets only, $2.00 higher; billets f.o.b. Pacific ports are $12 higher. Provo, $11.20 higher. Delivered prices do not reflect three per cent tax on freight rates.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

For exceptions on semi-finished steel see the footnote on the page of finished steel prices.

Alloy Billets, Blooms, Slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo, or Bethlehem, per gross ton $54.00
Price delivered Detroit $2.00 higher; E. Michigan, $3.00 higher.

Shell Steel

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.
Prices delivered Detroit are $2.00 higher; E. Michigan, $3 higher.
Price Exception: Follansbee Steel Corp. permitted to sell at $13.00 per gross ton, f.o.b. Toronto, Ohio, above base price of $52.00.
Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(*No. 5 to 9/32 in.*)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

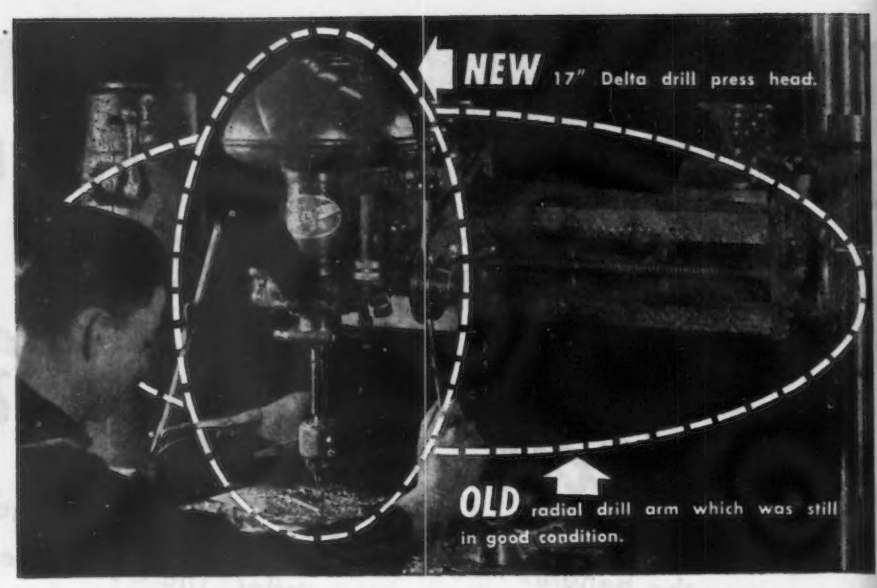
9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

TOOL STEEL

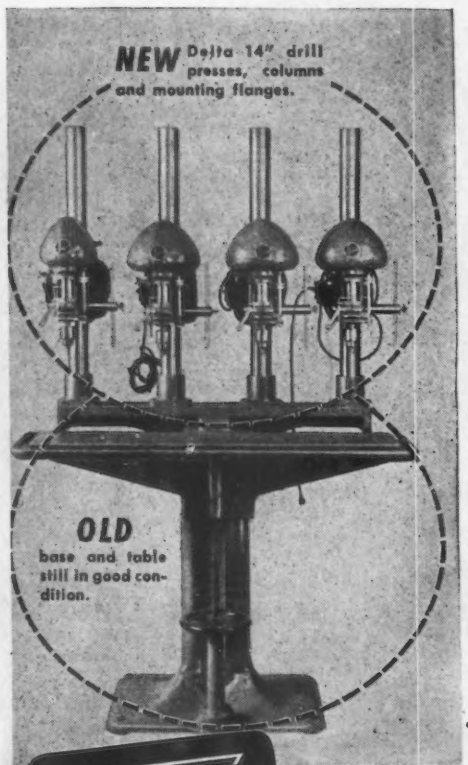
(*F.o.b. Pittsburgh, Bethlehem, Syracuse*)

	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 3c. higher.



You save *time* and *money* when you modernize old machinery with standard DELTA components



DELTA MILWAUKEE Machine Tools

Here are two typical cases in which plant engineers have modernized old machines with standard Delta components, instead of buying scarce, costly new machines.

If you have machines in your plant that are rapidly approaching obsolescence, investigate this modern, economical method of salvaging those parts that are still in good condition. Replace the worn units with standard, low-cost Delta components . . . designed and built with quality features that assure you of dependable, accurate performance.

These components also can be used to build special-purpose machines that are quickly available, economical, and adaptable when conditions change.

Delta's 76-page Blue Book gives you 140 examples . . .

— actual case histories in which special-purpose machines were built around standard Delta components—low in cost and quickly adaptable when conditions change. The same ingenious combinations can be used in reconverting for peace.

Write for your free copy.

MA-13

THE DELTA MANUFACTURING CO.
705M E. Vienna Ave., Milwaukee 1, Wis.
Please send me my free copy of your 76-page Blue Book and catalog of low-cost Delta tools.

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There is hardly an industrial field that does not use one or more of the many products listed and pictured on the pages of this new Baldwin bulletin. Between its covers you may find ways that Baldwin can help you with your immediate production problems or with your post-war plans.

A handy index of all the major products of The Baldwin Group, arranged in accordance with their applications in particular industries, will enable you to see at a glance where Baldwin can be of service. A request for Bulletin 211, on your regular letterhead, will bring this book to your desk without obligation on your part.

The Baldwin Locomotive Works, Philadelphia, Pa., U. S. A. Offices: Philadelphia, New York, Chicago, Washington, Boston, Cleveland, St. Louis, San Francisco, Detroit, Houston.

BLW THE BALDWIN GROUP

BALDWIN

The Baldwin Locomotive Works, Philadelphia, Pennsylvania: Locomotive & Ordnance Division; Baldwin Southwark Division; Cramp Brass and Iron Foundries Division; Standard Steel Works Division; The Whitcomb Locomotive Co.; The Pelton Water Wheel Co.; The Midvale Co.

POSTWAR

an announcement and a suggestion:

ANDREW C. CAMPBELL DIVISION developments for postwar are well past the "imagineering" stage. The complete line of **CAMPBELL ABRASIVE CUTTING MACHINES** is being redesigned for higher efficiency—longer wheel life—greater adaptability—more automatic features. In short, **CAMPBELL** machines are being prepared for the more highly competitive production demands that lie ahead.

To illustrate: A new, completely automatic abrasive cutting machine is now a reality. The first model has already been produced—the second and third are "on the boards." By making possible the running of several machines by one operator, this machine will find many applications where it will speed production and cut costs.

We suggest this: Consider any cutting operation you may have in the light of new, improved methods of abrasive cutting. Write us about it. We may be able to show you a way to get into postwar competitive production—*faster*.

• • •

Tell us (1) the range of sizes, (2) kind of material, (3) length of cut-off pieces, (4) length of stock before cutting, (5) tolerance for length of cut pieces and (6) hourly production requirement. With this information, **CAMPBELL** *engineers can recommend production procedure and work up cost sheets for you.*

Campbell

ABRASIVE CUTTING MACHINES

ANDREW C. CAMPBELL DIVISION
BRIDGEPORT · CONNECTICUT

ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ACCO
AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

PRICES

WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought pipe)
Base Price—$200.00 per Net Ton

	Black	Galv.
Steel (Butt Weld)		
⅛ in.	63½	51
¼ in.	66½	55
⅜ to 3 in.	68½	57½
Wrought Iron (Butt Weld)		
⅛ in.	24	3½
¼ in.	30	10
⅜ and ½ in.	34	16
¾ in.	38	18½
1 in.	37½	18
Steel (Lap Weld)		
2 in.	61	49½
2½ and 3 in.	64	52½
3½ to 6 in.	66	54½
Wrought Iron (Lap Weld)		
2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17
Steel (Butt, extra strong, plain ends)		
⅛ in.	61½	50½
¼ in.	65½	54½
⅜ to 3 in.	67	57
Wrought Iron (Same as Above)		
⅛ in.	25	6
¼ in.	31	12
⅜ to 2 in.	38	19½
Steel (Lap, extra strong, plain ends)		
2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56
Wrought Iron (Same as Above)		
2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher on all butt weld.

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
6-in. and larger, Birmingham	46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles	69.40
6-in. and larger f.o.b. cars, Seattle	71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger are $45 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes, Minimum Wall. Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots.

	Seamless Cold Drawn	Seamless Hot Rolled	Lap Weld, Hot Rolled
2 in. o.d. 13 B.W.G.	15.03	13.04	12.38
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.53
3 in. o.d. 12 B.W.G.	22.48	19.50	18.35
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.15
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb. or ft., and over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

PRICES

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	Pacific Coast Basing Points†
	Base per Keg	
Standard wire nails....	$2.55	$3.05
Coated nails	2.55	3.05
Cut nails, carloads.....	3.85	....
	Base per 100 lb.	
Annealed fence wire...	$3.05	$3.55
Annealed galv. fence wire	3.40	3.90
	Base Column	
Woven wire fence* ...	.67	.85
Fence posts, carloads..	.69	.86
Single loop bale ties...	.59	.84
Galvanized barbed wire**	.70	.80
Twisted barbless wire..	.70	....

*15½ gage and heavier. **On 80-rod spools in carload quantities.

†Prices subject to switching or transportation charges.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:

Base discount less case lots

	Per Cent Off List
⅛ in. & smaller x 6 in. & shorter...	65½
9/16 & ⅝ in. x 6 in. & shorter.....	63½
¾ to 1 in. x 6 in. & shorter.....	61
1⅛ in. and larger, all lengths.....	59
All diameters over 6 in. long.....	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed:

(Hexagon or Square)

⅛ in. and smaller	62
9/16 to 1 in. inclusive.....	59
1⅛ to 1½ in. inclusive.....	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	U.S.S.	S.A.E.
Base discount less keg lots		
7/16 in. and smaller.....	..	64
½ in. and smaller	62	..
½ in. through 1 in.....	..	60
9/16 in. through 1 in.....	59	..
1⅛ in. through 1½ in.....	57	58
1⅝ in. and larger	56	..

In full keg lots, 10 per cent additional discount.

Stove Bolts	*Consumer*
Packages, nuts loose	71 and 10
In packages, with nuts attached.....	71
In bulk	80

On stove bolts freight allowed up to 65c per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets

(½ in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets

(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5

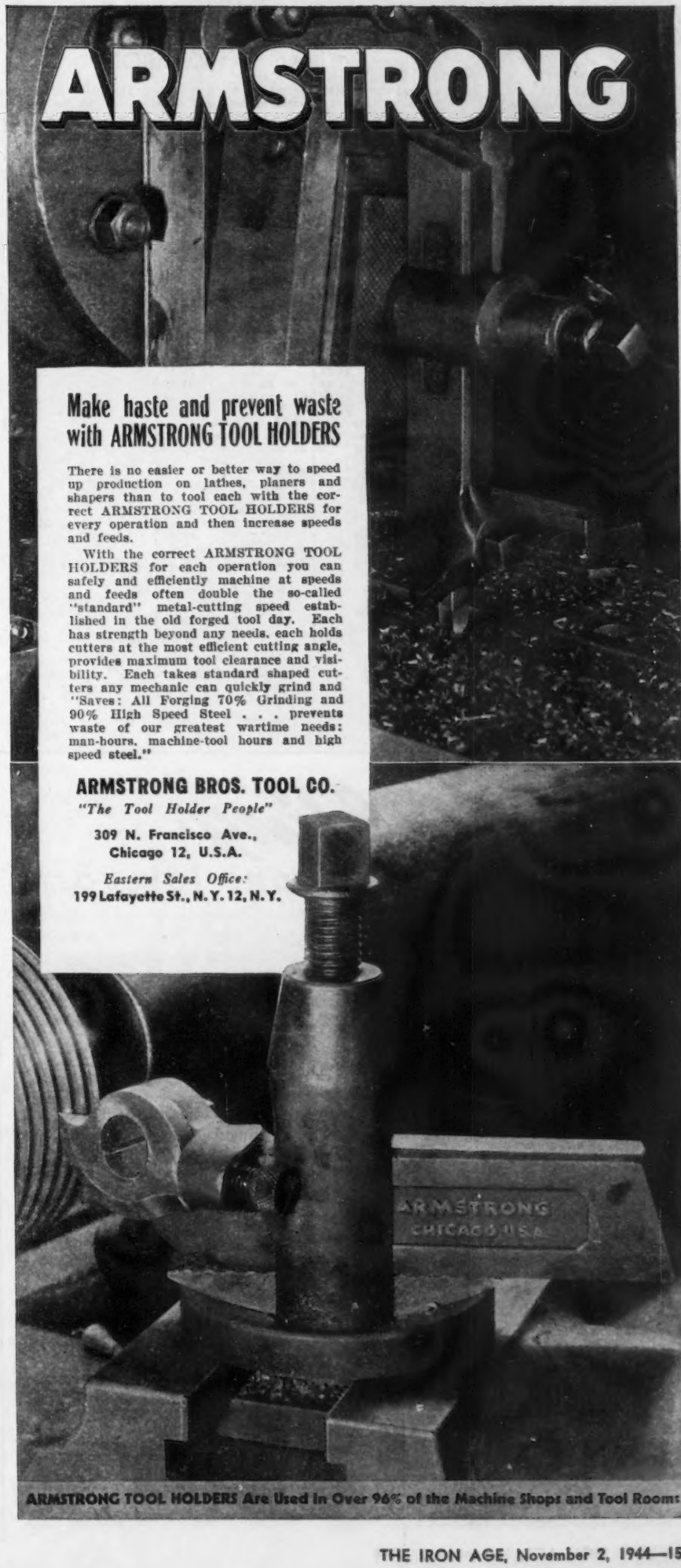
Cap and Set Screws	*Consumer Per Cent Off List*
Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.....	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes....	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in	20x28 in.
8-lb. coating I.C....	$6.00	$12.00
15-lb. coating I.C....	7.00	14.00
20 lb. coating I.C....	7.50	15.00



Make haste and prevent waste with ARMSTRONG TOOL HOLDERS

There is no easier or better way to speed up production on lathes, planers and shapers than to tool each with the correct ARMSTRONG TOOL HOLDERS for every operation and then increase speeds and feeds.

With the correct ARMSTRONG TOOL HOLDERS for each operation you can safely and efficiently machine at speeds and feeds often double the so-called "standard" metal-cutting speed established in the old forged tool day. Each has strength beyond any needs, each holds cutters at the most efficient cutting angle, provides maximum tool clearance and visibility. Each takes standard shaped cutters any mechanic can quickly grind and "Saves: All Forging 70% Grinding and 90% High Speed Steel . . . prevents waste of our greatest wartime needs: man-hours, machine-tool hours and high speed steel."

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

309 N. Francisco Ave., Chicago 12, U.S.A.

Eastern Sales Office:
199 Lafayette St., N.Y. 12, N.Y.

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

PIG IRON

All prices set in bold face type are maximum established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maximum. Delivered prices do not reflect 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable	ow Phos-phorus	Charcoal
Boston	*$25.50*	*$25.00*	*$26.50*	*$26.00*	.....	.....
Brooklyn	*27.50*	*27.00*	.....	*28.00*	.....	.....
Jersey City	*26.53*	*26.03*	*27.53*	*27.03*	.....	.....
Philadelphia (4)	*25.84*	*25.34*	*26.84*	*26.34*	*$30.74*	.....
Bethlehem, Pa.	$25.00	$24.50	$26.00	$25.50	.....	.....
Everett, Mass.	25.00	24.50	26.00	25.50	.....	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....	.....
Steelton, Pa.	.....	24.50	.....	.....	$29.50	.....
Birdsboro, Pa. (3)	25.00	24.50	26.00	25.50	29.50	.....
Sparrows Point, Md.	25.00	24.50	.....	.....	.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....	.....
Sharpsville, Pa. (1)	24.00	23.50	24.50	24.00	.....	.....
Buffalo	24.00	23.00	25.00	24.50	29.50	.....
Cincinnati, Ohio	*25.11*	*24.61*	.....	*25.11*	.....	.....
Canton, Ohio	*25.39*	*24.89*	*25.89*	*25.39*	*32.69*	.....
Mansfield, Ohio	*25.94*	*25.44*	*26.44*	*25.94*	*32.86*	.....
St. Louis	*24.53*	*24.50*	.....	.....	.....	.....
Chicago	24.00	23.50	24.50	24.00	*35.46*	.....*$37.34*
Granite City, Ill.	24.00	23.50	24.50	24.00	.....	.....
Cleveland	24.00	23.50	24.50	24.00	*32.42*	.....
Hamilton, Ohio	24.00	23.50	.....	24.00	.....	.....
Toledo	24.00	23.50	24.50	24.00	.....	.....
Youngstown	24.00	23.50	24.50	24.00	*32.42*	.....
Detroit	24.00	23.50	24.50	24.00	.....	.....
Lake Superior fc.	.....	.....	.....	.....	.....	34.00
Lyles, Tenn., fc. (2)	.....	.....	.....	.....	.....	33.00
St. Paul	*26.63*	*26.13*	*27.1*	*26.63*	*39.80*	.....
Duluth	24.50	24.00	25.00	24.50	.....	.....
Birmingham	20.38	19.00	25.00	.....	.....	.....
Los Angeles	*26.95*	.....	.....	.....	.....	.....
San Francisco	*26.95*	.....	.....	.....	.....	.....
Seattle	*26.95*	.....	.....	.....	.....	.....
Provo, Utah	22.00	21.50	.....	.....	.....	.....
Montreal	*27.50*	*27.50*	.....	*28.00*	.....	.....
Toronto	*25.50*	*25.50*	.....	*26.00*	.....	.....

GRAY FORGE IRON: Valley or Pittsburgh furnace $23.50

(1) Pittsburgh Coke & Iron Co. (Sharpsville, Pa., furnace only) and the Struthers Iron & Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable. Struthers Iron & Steel Co. may add another $1.00 per gross ton for iron from Struthers, Ohio, plant.

(2) Price shown is for low-phosphorus iron; high phosphorus sells for $28.50 at the furnace.

(3) E. & G. Brooke Co., Birdsboro, Pa., permitted to charge $1.00 per ton extra.

(4) Pittsburgh Ferromanganese Co. (Chester furnace only) may charge $2.25 a ton over maximum basing point prices.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 to 2.25 per cent); Phosphorus differentials, a reduction of 38c. per ton for phosphorus content of 0.70 per cent and over; Manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and $1 per ton extra for each additional 0.25 per cent nickel.

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, c. per lb., ton lots.

Copper, electrolytic, 150 and 200 mesh	21⅛ to 23½c.
Copper, reduced, 150 and 200 mesh	20½ to 25½c.
Iron, commercial, 100 and 200 mesh 96 + % Fe	13½ to 15c.
Iron, crushed, 200 mesh and finer, 99 + % Fe, carload lots	4c.
Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe, drum lots	63c.
Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe	30 to 33c.
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe	42c.
Iron, carbonyl, 300 mesh and finer, 98-99.8 + % Fe	90c.
Aluminum, 100 and 200 mesh	*23 to 27c.
Antimony, 100 mesh	20.6c.
Cadmium, 100 mesh	$1
Chromium, 150 mesh	$1.03
Lead, 100, 200 & 300 mesh,	11½ to 12½c.
Manganese, 150 mesh	51c.
Nickel, 150 mesh	51½c.
Solder powder, 100 mesh, 8½c. plus metal	
Tin, 100 mesh	58¾c.
Tungsten metal powder, 98%-99%, any quantity, per lb.	$2.60
Molybdenum powder, 99%, in 200-lb. kegs, f.o.b. York, Pa., per lb.	$2.60
Under 100 lb.	$3.00

*Freight allowed east of Mississippi.

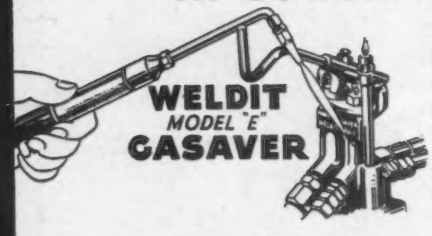
COKE

Furnace, beehive (f.o.b. oven)	Net Ton
Connellsville, Pa.	$7.00*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	8.25
Foundry, By-Product	
Chicago, del'd	13.35
Chicago, f.o.b.	12.60
New England, del'd	14.25
Kearny, N. J., f.o.b.	12.65
Philadelphia, del'd	12.88
Buffalo, del'd	13.00
Portsmouth, Ohio, f.o.b.	11.10
Painesville, Ohio, f.o.b.	11.75
Erie, del'd	12.75
Cleveland, del'd	12.80
Cincinnati, del'd	12.85
St. Louis, del'd	13.85
Birmingham, del'd	10.50

*Hand drawn ovens using trucked coal permitted to charge $7.75 per ton plus transportation charges.

Safe Welding

AT LOWER PRODUCTION COSTS



The Weldit Gasaver shuts off the welding flame when not in use. . . . Conserves essential materials by cutting oxygen and acetylene consumption as much as *fifty* per cent. Prevents injury to workmen—or sudden fires—from dangerous idle torch flames. . . . Adjustment remains unaltered between welds.

When the Weldit Gasaver has been installed, you simply hang idle torch on the handy lever rod. Weight of torch pulls rod down, thus automatically shutting off supply lines. Relight instantly by passing torch over Gasaver pilot light. No bother. . . . No time lost. . . . *No readjusting required.* . . . Price $10.00 at Detroit. Order today.

Better Soldering, Annealing and Heating Jobs

WELDIT
MODEL "CW"
BLOW TORCH

The Weldit Model CW Blowpipe is in daily use by many foremost industrial plants. . . . Built in accordance with the recommendations of leading fabricators of sheet metal products. . . . Operates on either natural gas, manufactured gas, or other low temperature fuel gas and compressed air. Stands up under rough shop use. . . . Send for literature.

WELDIT ACETYLENE CO.
641 BAGLEY AVENUE • DETROIT 26, MICH.

PRICES

REFRACTORIES
(F.o.b. Works)

Fire Clay Brick

	Per 1000
Super-duty brick, St. Louis	$64.60
First quality, Pa., Md., Ky., Mo., Ill.	51.30
First quality, New Jersey	56.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	46.55
Sec. quality, New Jersey	51.00
No. 1 Ohio	43.00
Ground fire clay, net ton	7.60

Silica Brick

Pennsylvania and Birmingham	$51.30
Chicago District	58.90
Silica cement, net ton (Eastern)	9.00

Chrome Brick

	Per Net ton
Standard chemically bonded, Balt., Plymouth Meeting, Chester	$54.00

Magnesite Brick

Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00

Grain Magnesite

Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$43.48
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

RAILS, TRACK SUPPLIES
(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton	$40.00
Angle splice bars, 100 lb.	2.70

(F.o.b. Basing Points)	Per Gross Ton
Light rails (from billets)	$40.00
Light rails (from rail steel)	39.00

	Base per Lb.
Cut spikes	3.00c.
Screw spikes	5.15c.
Tie plate, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25c.

CORROSION AND HEAT-RESISTING STEEL
(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	24.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

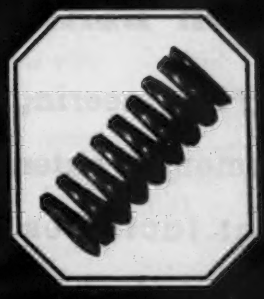
*Includes annealing and pickling.

ELECTRICAL SHEETS
(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

LEE
Quality Springs
ALL SHAPES • ALL SIZES • ALL MATERIALS



LEE SPRING COMPANY, Inc.
30 MAIN STREET BROOKLYN N.Y.

LEE-BUILT TRADE MARK SPRINGS

IF THERE IS A FLAW
"FLASH-O-LENS"
WILL FIND IT!

The new FLASH-O-LENS offers foundry-men, machinists, and many others engaged in producing metal parts for war contracts an efficient, economical means of examining the most minute defects during routine inspections.

FLASH-O-LENS consists of a portable 40x microscope combined with a perfect source of illumination in one convenient, compact unit . . . They are available in several models—powered by either standard flash light dry cells or by current from any AC or DC outlet—and with a selection of various combinations of lenses, all interchangeable in the one lens housing.

Send today for illustrated catalog describing the new FLASH-O-LENS

E. W. PIKE & COMPANY
PIKE
Manufacturers
ELIZABETH, N. J.

BANDS

KING

RINGS · FLANGES
GEAR BLANKS

FLATS

LEG OUT

King Engineering Department & extensive plant facilities are always at your service on any ring or flange problem you may have.

SQUARES

LEG IN

STEM OUT

KING FIFTH WHEEL COMPANY
2900 NORTH SECOND STREET · PHILADELPHIA 33 · PENNSYLVANIA

Ransohoff

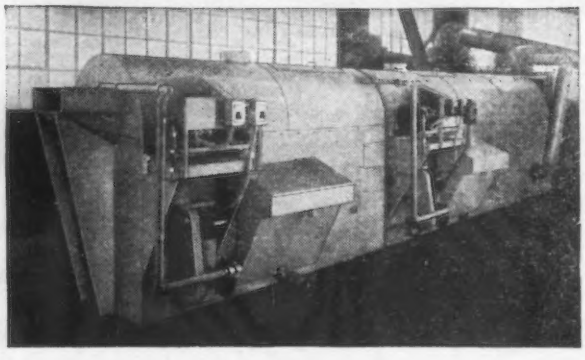
METAL CLEANING EQUIPMENT

These Folks Bought One

THEY NOW HAVE

EIGHT

RANSOHOFF METAL CLEANING MACHINES



A FEW years ago, this installation was just one RANSOHOFF CLEANING MACHINE . . . NOW 8 are installed, going full blast day after day. It's a great tribute . . . but deserved because RANSOHOFF EQUIPMENT is designed to set the pace in increasing output, quality of product and cutting cost of operation.

MACHINE illustrated is used to remove drawing compound from zinc battery shells before filling them with electrolyte. All traces of alkali must be removed before filling, otherwise the life of the battery will be shortened. It handles 40,000 pieces an hour.

RANSOHOFF ENGINEERS in the field and laboratory are glad to assist you. Write us.

N. RANSOHOFF, Inc. 1315 Township Ave. CINCINNATI, O.

PRICES

Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Bethlehem, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk)	$135.00
Carload lots (packed)	141.00
Less ton lots (packed)	148.50

Premium, $1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Manganese Metal

Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Spot sales add 2c. per lb.

96-98% Mn, .2% max. C, 1% max. Si, 2% max. Fe.

Carload, bulk	36c.
L.c.l. lots	38c.

95-97% Mn, .2% max. C, 1.5% max. Si, 2.5% max. Fe.

Carload, bulk	34c.
L.c.l. lots	35c.

Spiegeleisen

Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$35.00	$36.00
Less ton	47.50	48.50

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carlots, f.o.b. shipping point with freight allowed to destination.

	Eastern Zone	Central Zone	Western Zone
50% Si	6.65c.	7.10c.	7.25c.
75% Si	8.05c.	8.20c.	8.75c.
80-90% Si	8.90c.	9.05c.	9.55c.
90-95% Si	11.05c.	11.20c.	11.65c.

Spot sales add: 45c. per lb. for 50% Si, .3c. per lb. for 75% Si, .25c. per lb. for 80-90% and 90-95% Si.

Silvery Iron

(C/L, Per Gross Ton, base 6.00 to 6.50 Si)

F.o.b. Jackson, Ohio	$29.50*
Buffalo	30.75*

For each additional 0.50% silicon add $1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add $1 a ton for 0.75% phosphorous or over.

*OPA price established 6-24-41.

Bessemer Ferrosilicon

Prices are $1 a ton above silvery iron quotations of comparable analysis.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	3.35c.	3.50c.	3.65c.
2000 lb.-carload	3.8c.	4.2c.	4.25c.

Silicomanganese

Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk	6.05c.
2000 lb. to carload	6.70c.
Under 2000 lb.	6.90c.
Briquets, contract, basis carlots, bulk freight allowed, per lb.	5.80c.
2000 lb. to carload	6.30c.
Less ton lots	6.55c.

Ferrochrome

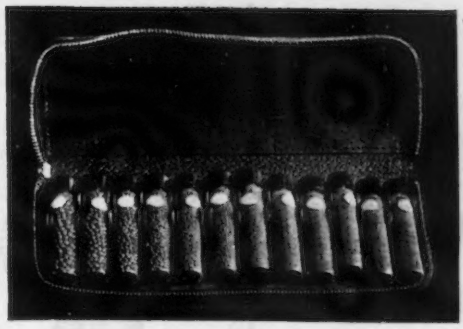
(65-72% Cr, 2% max. Si)

OPA maximum base contract prices per lb. of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.

	Eastern Zone	Central Zone	Western Zone
0.06% C	23.00c.	23.40c.	24.00c.
0.10% C	22.50c.	22.90c.	23.50c.
0.15% C	22.00c.	22.40c.	23.00c.
0.20% C	21.50c.	21.90c.	22.50c.
0.50% C	21.00c.	21.40c.	22.00c.
1.00% C	20.50c.	20.90c.	21.50c.
2.00% C	19.50c.	19.90c.	21.00c.
66-71% Cr, 4-10% C	13.00c.	13.40c.	14.00c.

Other Ferroalloys

Ferrotungsten, Standard grade, lump or ¼X down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa., York, Pa., per lb. contained tungsten, 10,000 lb. or more....	$1.90
Ferrovanadium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. contained Va.	
Open hearth	$2.70
Crucible	$2.80
Primos	$2.90
Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal.....	$1.50
Vanadium pentoxide, 88%-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5. Spot sales add 5c. per lb. contained V_2O_5.....	$1.10
Ferroboron, contract basis, 17.50% min., Bo, f.o.b. producer's plant with usual freight allowances, per lb. of alloy.	
2000 lb. to carload.....	$1.20
Under 2000 lb.....	1.30
Silcaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)	
Carload lots	25c.
2000 lb. to carload.....	26c.
Silvaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)	
Carload lots	58c.
2000 lb. to carload.....	59c.
Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis	
No. 1	87.5c.
No. 6	60c.
No. 79	45c.
Bortram, f.o.b. Niagara Falls	
Ton lots, per lb.....	45c.
Less ton lots, per lb.....	50c.
Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb. contained Cb.	
2000 lb. lots.....	$2.25
Under 2000 lb. lots.....	$2.30
Ferrotitanium, 40%-45%, 0.10%C. max. f.o.b. Niagara Falls, N. Y., ton lots, per lb. contained Ti..	$1.23
Less ton lots	$1.25
Ferrotitanium, 20%-25%, 0.10%C. max., ton lots, per lb. contained titanium	$1.35
Less ton lots.....	$1.40
High-carbon ferrotitanium, 15%-20%, 6%-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y., freight allowed East of Mississippi River, North of Baltimore and St. Louis, per carload.....	$142.50
Ferrophosphorus, 18% electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equalled with Rockdale, Tenn., per gross ton.....	$58.50
Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton	$75.00
Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo.	95c.
Calcium molybdate, 40%-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo.	80c.
Molybdenum oxide briquettes, 48%-52% Mo, f.o.b. Langeloth, Pa., per lb. contained Mo.....	80c.
Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb. contained Mo	80c.
Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add ¼c. for spot sales	
Carload lots	14c.
Zirconium, 12-15%, contract basis, lump f.o.b. plant usual freight allowances, per lb. of alloy	
Carload, bulk	4.6c.
Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk	5.75c.
Ton lots	7.25c.
Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.	
Car lots	8.75c.
Ton lots	9.25c.



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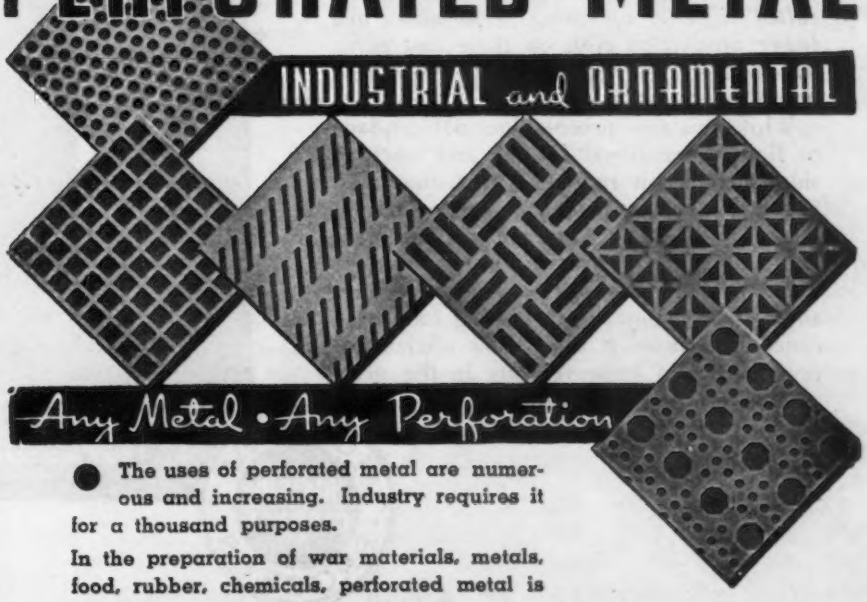

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